



## **School of Chemical Engineering**



**Professional Activity Report  
2008-2009**

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## Purdue University School of Chemical Engineering

### Message from the Head

2008-09 was a great year for the School of Chemical Engineering at Purdue University!

In February 2009, "Ramki" Ramkrishna was elected member of the National Academy of Engineering. This was a well-deserved honor for Ramki, who has been at Purdue since 1976. With this great recognition, the number of NAE members in our School is now five.

This was also a very successful year for faculty recruiting. We were fortunate to attract two new Assistant Professors: Yue Wu (PhD Harvard, 2006) and Raj Chakrabarti (PhD 2002, Princeton). They joined the faculty ranks in Fall 2009, at the same time as Chongli Yuan (PhD 2007, Cornell), recruited in 2007. Raj Chakrabarti obtained his AB at Harvard University, magna cum laude, in 2002. After his PhD, he was an NIH Post Doctoral Fellow at MIT and Columbia until 2006, when he became a Research Scholar at Princeton University. His research interests are Quantum Control and Information Theory, Theoretical and Computational Biophysics, and Applications to Energy Sciences. After obtaining his PhD degree, Yue Wu spent the last three years as the Miller Research Fellow in Chemistry at the University of California - Berkeley. His research interests are in Synthesis, Characterization, Assembly of Nanostructured Materials and their Potential Applications in Nanoscale Devices and Sustainable Energy. Chongli Yuan obtained her PhD Degree at Cornell University in 2007, then joined ETH-Zurich, as a Post Doctoral Research Associate. Her research interests are in Biomimetic Nanoparticle Systems and Molecular Biophysics. These three faculty members bring excitement, new energy, innovative ideas, and promising talent to our School.

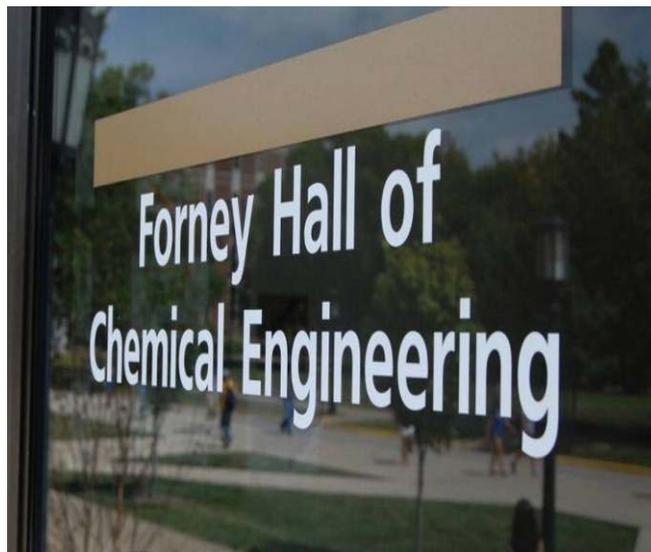
This year, we received several new, multiyear, major research and education grants. Starting with July 2009, Purdue ChE faculty are lead Principal Investigators for eight major federal research grants, ranging from \$650K to \$6.1MM. In addition, Purdue ChE faculty are Co-Principal Investigators in two other major federal grants, one for \$3MM and the other one for \$22.2MM. These grants include a DOE Energy Frontiers Research Center in liquid fuels from biomass based at Purdue, and another EFRC in atom-efficient chemical transformations where we partner with Argonne National Laboratory; an NSF Energy Frontiers in Research and Innovation (EFRI) grant on liquid fuels from biomass; two GAANN grants from the Department of Education in Solar Energy and Pharmaceutical Engineering, respectively; an NSF IGERT grant in Solar Energy; and DOE grants in education and research related to batteries for vehicles. These grants will continue our trajectory as leaders in important fields to society, such as solar energy, electric batteries, biofuels, and pharmaceutical engineering.

Just a few weeks ago, on September 24-25, the School hosted the Chemical Engineering of the Future symposium and you can read more details about this on the next page.

We hope that you will enjoy reading this summary of our accomplishments. These successes are the result of the dedication and talent of our faculty, staff and students, along with tremendous support of our alumni, friends, corporate partners and funding agencies.

Sincerely,

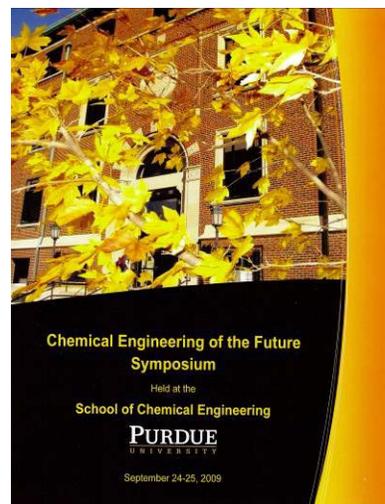
Arvind Varma  
R. Games Slayter Distinguished Professor  
Head, School of Chemical Engineering



## Chemical Engineering of the Future Symposium

This symposium aimed at exploring and defining some elements of the Future of Chemical Engineering. The discipline is rapidly and significantly expanding in new directions, such as renewable energy, healthcare, and nanotechnology. As educational institutions, we need to understand how to adjust our teaching methods, curriculum, and approach to continue to educate chemical engineers with the relevant knowledge and skills to be productive and successful in this changing landscape. As research institutions, we need to determine where our creative efforts will have the most impact in satisfying the needs of society, while living in harmony with the environment. The event involved a partnership of industry, research, and education leaders, as feasible and successful solutions to these critical issues require thoughtful approach by the various sectors.

The symposium focused on three topics: Energy, Healthcare Engineering and Pharmaceutical Engineering, and Education. Our faculty, staff, and students were honored to host more than 25 academic representatives of ChE Programs from the US, numerous industry representatives including the School's Industrial advisory Council, and the School of ChE Ambassadors. The program included visits of research and instructional laboratories in the Forney Hall of Chemical Engineering, and tours of the Birck Nanotechnology Center in Purdue's Discovery Park, and the labs of the NSF sponsored Structured Organic Particulate Solids (SOPS) ERC at Purdue where ChE faculty members are playing a leading role. .



Rakesh Agrawal moderated the first topic, with discussions around a grand challenge of our time: finding sustainable, cost-effective and efficient solutions to energy needs of society. It is critical that we prepare chemical engineering graduates so they can effectively contribute to the solution of this challenge. During the session, issues associated with production, transformation and use of various forms of energy including biomass, solar, and fossil fuels were discussed. The lead speaker, Maureen McCann (Purdue) was accompanied by panelists Andrew Gellman (Carnegie Mellon), Edmund Seebauer (UIUC), and Fouad Teymour (IIT, Chicago).

Rex Reklaitis guided the discussion on pharmaceutical and healthcare engineering, as a high visibility and priority national issue. The continuing rise in total healthcare expenditures is fiscally unsustainable. Instead of limiting cost increases by restricting treatment and services, the preferable approach is to increase efficiency, improve delivery and reduce cost of the devices and medicine through engineering innovations. During the discussion, ingenious ways were presented in which chemical engineers can impact the design, development and manufacture of novel medical devices, materials and drugs, as well as in the invention and development of diagnostic aids and instrumentation used in monitoring and assessing patient medical condition. The main speaker, Elizabeth Topp (Purdue) was followed by panelists Arindam Bose (Pfizer), Surya Mallapragada (Iowa State), and Joseph Pekny (Purdue).

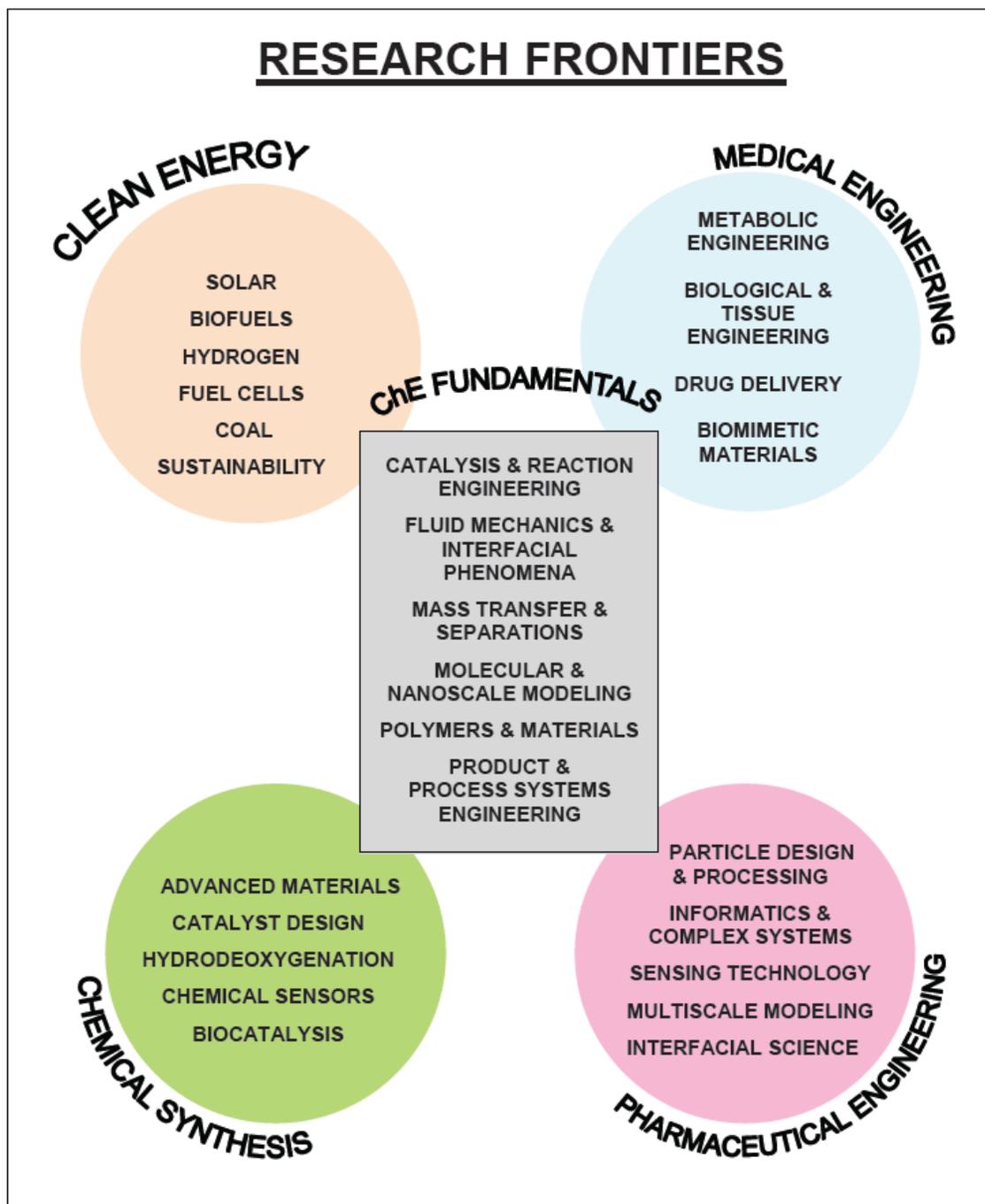
Phillip Wankat moderated the discussion of how disciplines of engineering, including chemical engineering, are self-examining the effectiveness of the current education process. Several non-traditional approaches were presented, such as the ChE Pillars introduced at the University of Pittsburgh and the all faculty/no-TA/5 meetings a week teaching schedule at the University of Minnesota. The emphasis was on how to help students learn the right concepts, not how to teach. The lead speaker, Joseph McCarthy (Pittsburgh), along with panelists Pedro Arce (Tennessee Tech), Edward Cussler (Minnesota), and David DiBiasio(WPI) participated.



The dinner talk, prepared by Rajeew Gautam, President and CEO of UOP LLC, and presented by Ben Christolini, VP and CTO UOP, LLC, gave an industrial perspective on the Future of ChE, with a particular focus on energy and raw materials.

The issues presented generated creative debate and inspired researchers, educators, and industrial leaders to consider novel approaches to solving current and long term challenges. We were honored to host such a diverse, vibrant, and refreshing meeting of the minds. The feedback from the attendees was overwhelmingly positive and we thank all participants for contributing to the success of this symposium.

# RESEARCH FRONTIERS



## Fields of Study

**Catalysis and Reaction Engineering** – Baertsch, Delgass, Ramkrishna, Ribeiro, Thomson, Varma

**Fluid Mechanics and Interfacial Phenomena** - Basaran, Beaudoin, Corti, Franses, Harris, Houze, Kim, Litster

**Mass Transfer and Separations** – Agrawal, Franses, Wang, Wankat

**Molecular and Nanoscale Modeling** – Chakrabarti, Corti, Harris, Thomson, Won

**Polymers and Materials** - Caruthers, Hillhouse, Litster, Pipes, Varma, Won, Wu

**Product and Process Systems Engineering** - Agrawal, Caruthers, Kim, Litster, Pekny, Reklaitis, Venkatasubramanian

**Chemical Synthesis** - Baertsch, Caruthers, Delgass, Morgan, Ribeiro, Thomson, Varma

**Energy** - Agrawal, Baertsch, Caruthers, Chakrabarti, Delgass, Hillhouse, Ho, Morgan, Pekny, Ribeiro, Varma, Wu

**Medical Engineering** - Caruthers, Chakrabarti, Franses, Liu, Morgan, Pekny, Pipes, Ramkrishna, Won, Yuan

**Pharmaceutical Engineering** - Basaran, Beaudoin, Harris, Kim, Litster, Ramkrishna, Reklaitis, Venkatasubramanian

# Faculty



## **Rakesh Agrawal**

Sc. D., Massachusetts Institute of Technology, 1980

**Winthrop E. Stone Distinguished Professor**  
**Member, National Academy of Engineering**

**AICHE Fuels and Petrochemicals Division Award (2008)**  
**Inaugural winner of Excellence in Gas Processing Award, Annual Gas Processing Symposium, Qatar (2009)**

### **Research Areas**

**Energy transformation and use issues for solar, coal, biomass and hydrogen economy;**  
**Novel separation processes using distillation, membranes and adsorption; Process development, cryogenics and gas liquefaction processes**

### **Selected Professional Activities**

Consulting Editor, Separations, AIChE Journal  
Member, AIChE Board of Directors  
Member, NRC Committee on Assessment of Resource Needs for Fuel Cell and Hydrogen Technologies  
Member, Chemical Engineering Department Advisory Committee, Worcester Polytechnic Institute  
Member, Technical Advisory Board, Dow Chemicals  
Member, Technical Advisory Board, Kyrrogen Ltd.  
Member, Technical Advisory Board, Weyerhaeuser  
Member, National Academies Renewables Panel for the Committee on America's Energy Future

### **Selected Invited Lectures**

"Sustainable Energy Utilization and Transformation," George W. Woodruff School of Mechanical Engineering's Sustainable Energy Pathways and Solutions Workshop, Georgia Tech., Atlanta, April (2009).

"Energy Solutions for a Fossil Fuel Deprived Future," National Science Foundation, Arlington, VA, October (2008).

"Energy Solutions for a Future Solar Economy," Tis Lahiri Lecture, Chemical and Biomolecular Engineering, Vanderbilt University, Nashville, TN, October (2008).

"Energy Solutions for a Fossil Fuel Deprived Future," W. R. Marshall Founders' Lecture, Department of Chemical and Biological Engineering, University of Wisconsin, Madison, WI, September (2008).

"Energy Systems Analysis," Pan American Institute (PASI) Workshop, Mar Del Plata, Argentina, August (2008).

"Synergistic Processes to Produce Biofuels from Biomass," C. Murthy Memorial Lecture, Indian Institute of Chemical Engineers, Chandigarh, India, December (2008).

### **Selected Publications**

Q. J. Guo, G. M. Ford, H. W. Hillhouse, R. Agrawal, "Sulfide Nanocrystal Inks for Dense Cu(In<sub>1-x</sub>Ga<sub>x</sub>)(S<sub>1-y</sub>Se<sub>y</sub>)<sub>2</sub> Absorber Films and Their Photovoltaic Performance," *Nano Letters*, **9** (8), 3060 (2009).

Agrawal, R., Singh, N.R., "Synergistic Routes to Liquid Fuel for a Petroleum Deprived Future," *AIChE Journal*, **55** (7), 1898 (2009).

Q. J. Guo, H. W. Hillhouse and R. Agrawal "Synthesis of Cu<sub>2</sub>ZnSnS<sub>4</sub> Nanocrystal Ink and Its Use for Solar Cells," *Journal of American Chemistry Society*, **191**, 11672 (2009).

Guo, Q.J. Kim, S.J., Kar, M., Shafarman, W.N., Birkmire, R.W., Stach, E.A., Agrawal R., Hillhouse, H.W., "Development of a CuInSe<sub>2</sub> Nanocrystal and Nanoring Inks for Low-Cost Solar Cells," *Nano Letters*, **8** (9), 2982 (2008).

A. Giridhar and R. Agrawal, "Characteristics of a Good Search Space for Distillation Network Synthesis," *Computers & Chemical Engineering*, in press.

"A Novel Formulation for Synthesis of Energy-Efficient Low-Cost Distillation Networks," A. Giridhar and R. Agrawal, *Computers & Chemical Engineering*, in press.

### **Selected Conference Presentations**

Keynote Lecture: "Transportation Fuel in a Solar Economy," FOCAPD, Breckenridge, Co, June (2009).

"Transportation Fuel in a Fossil Fuel Free world," Renewable Energy World 2009, Las Vegas, March (2009).

Opening Plenary Lecture: "Energy Solutions for a Fossil Fuel Deprived Future," Schlinger Symposium, Chemical Heritage Foundation, Philadelphia, PA, September (2008).

### **Intellectual Property**

Agrawal, R., Shah, V.H., and Giridhar, A.V., "Process for distillation of Multicomponent Mixtures, More Particularly Petroleum Crude, into Five Product Streams", Pending US Patent Application.

Agrawal, R., Singh, N.R. "Novel Integrated Gasification-Pyrolysis Process", Pending US patent Application.

Agrawal, R., Guo, Q.J., Hillhouse, H.W., "Selenization of Precursor layer containing CuInS<sub>2</sub> Nanoparticles", Pending US Patent Application.

Guo, Q.J., Agrawal, R., "Synthesis of Multinary Chalcogenide Nanoparticles Comprising of Cu, Zn, Sn, S, and Se", Pending US Patent Application.



## Chelsey D. Baertsch

Ph. D., University of California at Berkeley, 2001

Assistant Professor

2009 Shreve Prize for Outstanding Teaching in Chemical Engineering

### Research Areas

Heterogeneous catalysis, micro catalytic sensors, MEMS, metal oxide nanostructures

### Selected Professional Activities

Reviewer, NSF, CBET Catalysis and Biocatalysis

Program Co-Chair for Sensors Topical, AIChE Annual Meeting (2008)

Session Chair/Co-Chair "In-situ and Operando Spectroscopy of Catalysts and Fundamentals of Oxide Catalysts," AIChE Annual Meeting (2008).

Sensors Topical Session Chair "Environmental, Catalytic, Industrial, and Virtual Gas Sensors," AIChE Annual Meeting (2008).

### Selected Publications

Polster, C.S., Nair, H., and Baertsch, C.D., "Study of Active Sites and Mechanism Responsible for Highly Selective CO Oxidation in H<sub>2</sub> Rich Atmospheres by a Mixed Cu and Ce Oxide Catalyst," *Journal of Catalysis*, **266** (2), 308-319 (2009).

Nair, H. and Baertsch, C.D., "Method for Quantifying Redox Site Densities in Metal Oxide Catalysts: Application to the Comparison of Ethanol Oxidative Dehydrogenation Turnover Frequencies over Alumina-supported VO<sub>x</sub>, MoO<sub>x</sub>, and WO<sub>x</sub> Catalysts," *Journal of Catalysis*, Priority Communication, **258**, 1-4 (2008).

Polster, C.S. and Baertsch, C.D., "Application of CuO<sub>x</sub>-CeO<sub>2</sub> catalysts as selective substrates for catalytic detection of CO in H<sub>2</sub> fuel," *Chemical Communications*, 4046 – 4048 (2008).

Tan, C.K.C., Delgass, W.N., Baertsch, C.D., "Spatially resolved in-situ FTIR analysis of CO adsorption and reaction on Pt/SiO<sub>2</sub> in a silicon microreactor," *Applied Catalysis B: Environmental*, (in press).

### Selected Invited Lectures

"Catalyst and Microsensor Design for Highly Selective Gas Sensors," Chemical Engineering Seminar, Department of Chemical Engineering, University of Waterloo, Waterloo, Canada, March (2009).

"Catalyst Design for Chemical Microsensors," Chemical Engineering Seminar, Department of Chemical Engineering, Case Western Reserve University, Cleveland, OH, October (2008).

### Selected Conference Presentations

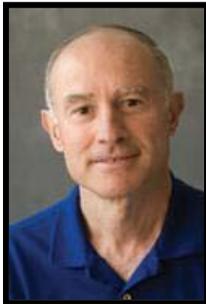
Nair, H., Baertsch, C.D., "Mechanism and Active Site Elucidation for Ethanol Oxidative Dehydrogenation over Supported WO<sub>x</sub>, MoO<sub>x</sub>, and VO<sub>x</sub> catalysts," AIChE Annual Meeting, Philadelphia, PA, November (2008).

Nair, H., Baertsch, C.D., "Mechanistic Insights into Thermal Degradation of Phosphomolybdic Acid," AIChE Annual Meeting, Philadelphia, PA, November (2008).

Polster, C.S., Baertsch, C.D., "Detailed Mechanistic Understanding of CO/H<sub>2</sub> Preferential Oxidation on CuO<sub>x</sub>-CeO<sub>2</sub>," AIChE Annual Meeting, Philadelphia, PA, November (2008).

Baertsch, C.D., Gatt, J.E., Polster, C.S., Zhang, R., "Catalyst and Microsystem Design for Microchemical Gas Sensors," AIChE Annual Meeting, Philadelphia, PA, November (2008).





## Osman Basaran

Ph. D., University of Minnesota, 1984

Reilly Professor of Fluid Mechanics

Fellow of the American Physical Society (APS)-Division of Fluid Dynamics (2008)

### Research Areas

Fluid Mechanics, Rheology, Drop Dynamics, Interfacial Phenomena, Finite Element Computational Analysis, Ink-Jet Printing, MEMS, Electro-separations

### Selected Professional Activities

Member, KAUST fellowship/scholarship panel, Washington D.C.

Session Chair, "Interfacial Flows," AIChE Annual Meeting, Philadelphia, Pennsylvania, November (2008)

Minisymposium Organizer (with Robert T. Collins of Sandia National Labs and Ronald Suryo of ExxonMobil), "Minisymposium on tip streaming and flow/EHD flow focusing," 61st Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), San Antonio, Texas, November, (2008)

Session Chair, "Drops I (Session AG)," 61st Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), San Antonio, Texas, November, (2008).

### Selected Invited Lectures

"Electrohydrodynamic tip-streaming and emission of charged drops from liquid cones," Chemistry Department, George Washington University, Washington D.C., April (2009).

"Electrohydrodynamic tip-streaming and emission of charged drops from liquid cones," Computations in Science Seminars, University of Chicago, Chicago, Illinois, September (2008).

"Electrohydrodynamic tip-streaming and emission of charged drops from liquid cones," Mechanical Engineering Department, Yale University, New Haven, Connecticut, November (2008).

"Complex free surface flows with multi-physics: emission of charged drops from liquid cones and breakup of viscoelastic jets/filaments," Procter & Gamble Corporation, Cincinnati, Ohio, November (2008).

"Small-scale flows exhibiting singularity formation, interface rupture, and unexpected dynamics," Bausch and Lomb, Rochester, NY, August (2008).

### Selected Publications

Bhat, P. P., Basaran, O. A., and Pasquali, M., "Beads-on-string formation during filament pinch-off: dynamics with the PTT model for non-affine motion," *J. Non-Newtonian Fluid Mech.* **159**, 64-71 (2009).

### Selected Conference Presentations

Basaran, O. A., "Interplay between simulation, theory, and experiment in inkjet printing of complex fluids," Nanotech 2009, Houston, Texas, May (2009).

Bhat, P. P., Jones, J. J., Pasquali, M. and Basaran, O. A., "Formation and pinch-off of viscoelastic filaments: Numerical analysis and ink-jet experiments," 15<sup>th</sup> International Congress on Rheology, Monterey, California, August (2008).

Bhat, P., Pasquali, M., McKinley, G. H., and Basaran, O. A., "Formation of beads-on-a-string during pinch-off of viscoelastic filaments," AIChE Annual Meeting, Philadelphia, PA, November (2008).

Collins, R. T., Jones, J. J., Harris, M. T., and Basaran, O. A., "Electrohydrodynamic tip-streaming and emission of charged drops from liquid cones," AIChE Annual Meeting, Philadelphia, PA, November (2008).

Gao, H., Xu, Q., and Basaran, O. A., "Numerical analysis of drop-on-demand (DOD) drop formation: dynamics due to a square wave inflow boundary condition," 61st Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), San Antonio, Texas, November, (2008).

Basaran, O. A., "Electrohydrodynamic and flow induced tip-streaming," in Minisymposium on Tip-Streaming and Flow/EHD Flow Focusing, 61st Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), San Antonio, Texas, November, (2008).

Ramalingam, S. and Basaran, O. A., "Equilibrium shapes and stability of a coupled interface system consisting of a liquid bridge and a pendant drop," 61st Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), San Antonio, Texas, November, (2008).

### Intellectual Property

Xu, X. and Basaran, O. A., "Method for producing ultra-small drops," U.S. patent application.





Biosensors

## Stephen P. Beaudoin

Ph. D., North Carolina State University, 1995

### Professor

**Purdue University Faculty Scholar (2006-2011)**

**Purdue University Provost Fellow (2008-2010)**

### Research Areas

Particle and Thin Film Adhesion, Electronic Materials, Chemical Mechanical Polishing,

### Selected Professional Activities

Symposium Chair, "Pharmaceuticals", AIChE Midwest Regional Conference, Chicago, IL, September (2008)

Project leader "3.1 Particle Characterization", NSF ERC for Structured Organic Particulate Systems

President, Particle Division, Adhesion Society, 2008-present

### Selected Invited Lectures

Kilroy, C., Pham, B., and Beaudoin, S., "Adhesion of Micro-/Nano-Scale Explosive Particles to Surfaces," Gordon Research Conference – Detecting Illicit Substance: Explosives and Drugs, Les Diablerets, Switzerland, June (2009).

Beaudoin, S., "Adhesion of Explosive Particles to Substrates," Trace Detection Workshop, Combating Terrorism Technical Support Office, Technical Support Working Group (TSWG), Arlington, VA, February (2009).

Beaudoin, S., "Adhesion of Explosive Particles to Substrates," Trace Sampling Workshop, Department of Homeland Security, Science and Technology Directorate, Transportation Security Laboratory, Atlantic City, NJ, February (2009).

Beaudoin, S. "Purdue Industry Academia/Pharma Consortium," AIChE Midwest Regional Conference, Chicago, IL, September (2008).

Beaudoin, S., Jaiswal, R., Kilroy, C., Balachandran, D., Lee, K.-M., "Pharmaceutical Particle Adhesion to Surfaces," AIChE Midwest Regional Conference, Chicago, IL, September (2008).

Beaudoin, S. "Nano- and Micro-Particle Adhesion," Sixth International Surface Cleaning Workshop, Northeastern University/NSF Center for Microcontamination Control, November (2008).

### Selected Publications

Kim, B. and Beaudoin, S., "Electrochemical Analysis of Surface Films on Copper in Phosphoric Acid, with a Focus on Microelectronics Processing," *Journal of the Electrochemical Society*, **156**(5), H390-H395 (2009).

Jaiswal, R., and Beaudoin, S., "Modeling and Validation of the van der Waals Force during the Adhesion of Nanoscale Objects to Rough Surfaces: A Detailed Description," *Langmuir*, (in press).

### Selected Conference Presentations

Kim, B.S., Kilroy, C., and Beaudoin, S.P., "Electrochemical Study on Surface Film Formation on Copper in Phosphoric and Nitric Acid," AIChE Annual Meeting, Philadelphia, PA, November (2008).

Lee, K. M., Balachandran, D., Carvajal, M. T., and Beaudoin, S. P., "A Quantitative Study of the Effects of Humidity on the Adhesion of Pharmaceutical Particles to Stainless Steel," AIChE Annual Meeting, Philadelphia, PA, November (2008).

Pham, B.-V., and Beaudoin, S., "Characterization of the Interaction Forces between Bovine Serum Albumin and Self-Assembled Monolayers," AIChE Annual Meeting, Philadelphia, PA, November (2008).





## James M. Caruthers

Sc. D., Massachusetts Institute of Technology, 1977

### Professor

### Research Areas

Materials Design, Non-linear Viscoelasticity of Polymers, Glass-to-Rubber Transition, Engineering Elastomers, Catalyst Design, Bioinformatics

### Selected Professional Activities

Board of Directors, Discovery Park Cyber Center  
Director, Center of Impact Science

### Selected Publications

Cao, J., Novstrup, K.A., Goyal, A., Midkiff, S.P. and Caruthers, J.M., "An Optimized Compiler for Parallel Chemistry Simulation," *International Journal of Parallel Programming*, **37**(2), 127-152 (2009).

Cao, J., Novstrup, K.A., Goyal, A., Midkiff, S.P. and Caruthers, J.M., "A Parallel Levenberg-Marquardt Algorithm," *IEEE Transactions on Parallel and Distributed Computing*, Proceedings of the 23rd International Conference on Supercomputing (ICS '09), (in press).

Goyal, A., Cao, J., Patkar, P., Medvedev, G.A., Midkiff, S.P., Venkatasubramanian, V. and Caruthers, J.M., "Population Balance Kinetic Model for Interaction of 2-Bisbenzothiazole-2'-disulfide (MBTS) with Sulfur," *Rubber Chemistry & Technology*, **181**(4), 671-708 (2008).

Kromer, B. R., Cao, L., Cumarantunge, L., Mulla, S. S., Ratts, J. L., Yezerets, A., Currier, N. W., Ribeiro, F. H., Caruthers, J.M., and Delgass, W. N., "Modeling of NO Oxidation and NO<sub>x</sub> Storage on Pt/BaO/Al<sub>2</sub>O<sub>3</sub> NO<sub>x</sub> Traps," *Special Issue Catalysis Today*, **136**, 93-103 (2008).

Cao, L., Ratts, J. L., Yezerets, A., Currier, N. W., Caruthers, J.M., Ribeiro, F.H. and Delgass, W.N., "Kinetic Modeling of NO<sub>x</sub> Storage-Reduction of Pt/BaO/Al<sub>2</sub>O<sub>3</sub> Monolith Catalysts," *Industrial & Engineering Chemistry Research*, **47**, 9006-9017 (2008).

Manz, T. A., Sharma, S., Phomphrai, K., Novstrup, K.A., Fenwick, A. E., Fanwick, P.E., Medvedev, G.A., Abu-Omar, M.M., Delgass, W.N., Thomson, K.T. and Caruthers, J.M. "Quantitative Effects of Ion Pairing and Sterics on Chain Propagation Kinetics for 1-Hexene Polymerization Catalyzed by Mixed Cp'/ArO Complexes," *Organometallics*, **27**(21) 5504-5520 (2008).

Chan, K., Schweizer, K.S., Stamm, R., Lee, E. W., Lee, E. and Caruthers, J.M., "Theory of Nonlinear Creep in Polymer Glass," *Journal Chemical Physics*, **129**, 184904 (2008).

Lee, H-N., Paeng, K., Swallen, S.F., Ediger, M.D., Stamm, R.A., Medvedev, G.A. and Caruthers, J.M., "Molecular Mobility of Pmma Glass during Uniaxial Tensile Creep Deformation," *J. Polymer Sci.: Polymer Physics*, (in press).

### Selected Conference Presentations

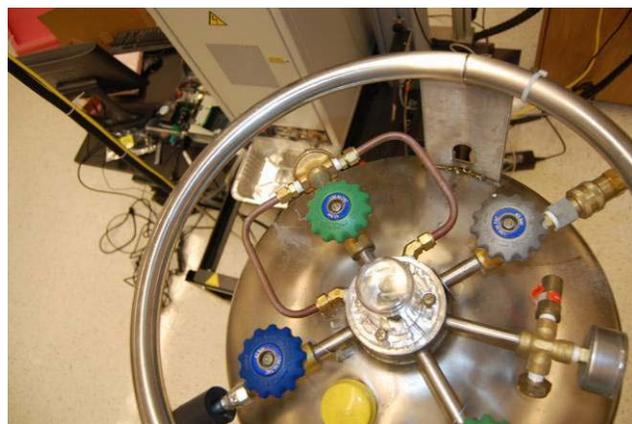
Lee, E-W., Stamm, R.A., Medvedev, G.A. and Caruthers, J.M., "Viscoelastic and Nonlinear Mechanical Behavior of Lightly Crosslinked PMMA," SEM Annual Conference of Experimental and Applied Mechanics, Albuquerque, NM, June (2009).

Kadrmaz, C.R., Stamatis, S.D., Cao, J., Won, Y.-Y., Pipes, R.B., and Caruthers, J.M., "Quantitative Evaluation of Kinetic Models for Cure of Epoxy Resins," SAMPE '09, Baltimore, MD, May (2009).

Medvedev, G.A. and Caruthers, J.M., "A Model of Glassy Polymers that Includes both Spatial and Temporal Fluctuations," 2009 APS Annual Meeting, Pittsburg, PA, March (2009).

K. A. Novstrup, Medvedev, G.A., Travia, N. E., Stanciu, C., Switzer, J. M., Manz, T. A., Delgass, W. N., Abu-Omar, M. M. and Caruthers, J. M., "Kinetic Modeling of Single-Site Olefin Polymerization with Multi-Response Data: Even Models with Many Parameters Cannot Fit an Elephant," AIChE Annual Meeting, Philadelphia, PA, November (2008).

Stamatis, S.D., Krishnamurthy, B.B., Shehab, A., Malik T., Delgass, L., Dunlop, S.R. and Caruthers, J.M., "A Data Model Supporting Intelligent Search for Materials Research," AIChE Annual Meeting, Philadelphia, PA, November (2008).





**Raj Chakrabarti**  
PhD, Princeton University, 2002

**Assistant Professor**

**Research Areas**

**Quantum Control and Information Theory, Theoretical and Computational Biophysics,  
Application to Energy Sciences**

**Selected Invited Lectures**

"Quantum multiobservable control", American Physical Society National Meeting, March (2009).

"Quantum control landscapes and the design of adaptive feedback control algorithms", Wolfgang Pauli Institute, University of Vienna, Department of Mathematics, February (2009).

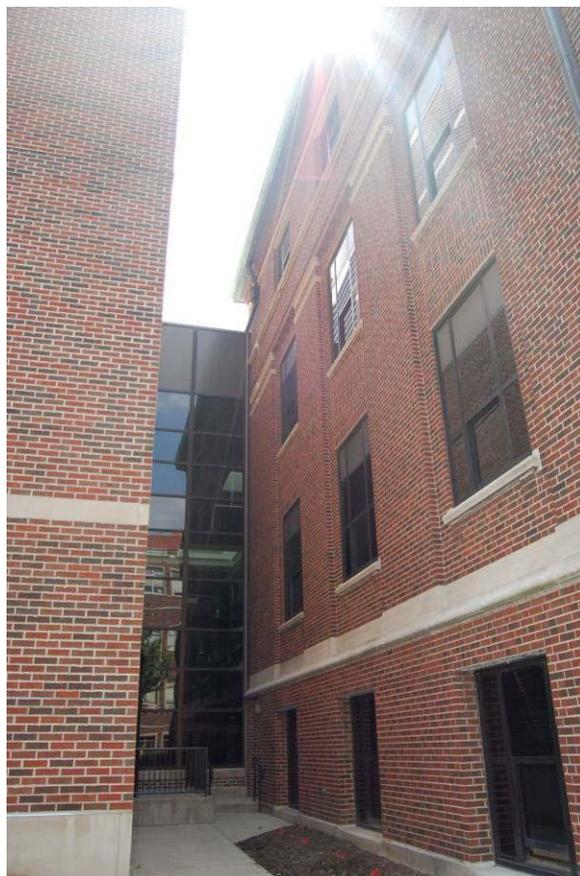
**Selected Publications**

Chakrabarti, R., Rabitz, H., Springs, S. and McLendon, G., "Mutagenic evidence for the optimal control of evolutionary dynamics," *Phys. Rev. Lett.* **100**: 258103 (2008).

Wu, R.B., Chakrabarti, R. and Rabitz, H., "Optimal control theory for continuous variable quantum gates," *Phys. Rev. A* **77**: 052303 (2008).

Chakrabarti, R., Wu, R.B. and Rabitz, H., "Quantum multiobservable control," *Phys. Rev. A* **77**: 063425 (2008).

Chakrabarti, R., Wu, R.B. and Rabitz, H. "Quantum Pareto optimal control," *Phys. Rev. A* **78**: 033414 (2008).  
Chakrabarti, R., Bartning, A. P. and Sengupta, S.  
"Developing globally compatible institutional infrastructures for Indian higher education," *Journal of Studies in International Education*, (in press).





## David S. Corti

Ph. D., Princeton University, 1997

**Associate Professor**  
**Director of Undergraduate Studies**

### Research Areas

**Molecular Thermodynamics, Metastable Liquids, Nucleation Phenomena,  
Colloidal Dispersions, Computer Simulation Techniques**

### Selected Professional Activities

Session chair, "Thermodynamics and Phase Behavior II,"  
AIChE National Meeting, Philadelphia, PA, November  
(2008).

Session co-chair, "Fundamentals of Nucleation", AIChE  
National Meeting, Philadelphia, PA, November (2008).

Session co-chair, "Thermodynamics and Phase Behavior:  
Poster Session," AIChE National Meeting, Philadelphia, PA,  
November (2008).

Area 1a Program Organizer for 2009 AIChE Annual Meeting,  
Nashville, TN.

### Selected Invited Lectures

"Activated Instability of Homogeneous Nucleation and  
Growth in Metastable Fluids," Department of Chemical  
Engineering, Princeton University, Princeton, NJ, May (2009).

### Selected Publications

Uline, M. J., and Corti, D. S., "Comment on 'Effect of a  
Perturbation on the Chemical Equilibrium: Comparison with  
Le Chatelier's Principle' by E.M. Torres," *J. Chem. Educ.* **85**,  
1052-1053 (2008).

Siderius, D. W., and Corti, D. S., "On the Line Tension of  
Curved Boundary Layers. I. Boundary Thermodynamics," *J.*  
*Phys. Chem. B*, Ted Davis Festschrift, (in press).

### Chapters in Books

K. C. Chao, D. S. Corti and R. G. Mallinson,  
"Thermodynamics of Fluid Phase and Chemical Equilibria",  
Chapter 4 in Albright's Chemical Engineering Handbook, ed.  
L. Albright, CRC Press, (2009).

### Selected Conference Presentations

Sturtevant, B., and Corti, D. S., "Computational Studies of  
Colloidal Dynamics in Entropic Force Fields," 83rd ACS  
Colloid & Surface Science Symposium, New York, NY, June  
(2009).

Sturtevant, B., and Corti, D. S., "Computational Study of  
Lubrication Forces Between Colloidal Particles and Planar  
Surfaces," 83rd ACS Colloid & Surface Science Symposium,  
New York, NY, June (2009).

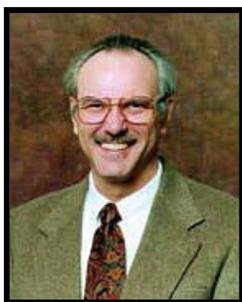
Hur, J., Sturtevant, B., Torabi, K., Corti, D. S., and Won, Y.-  
Y., "Structure and Crystallization of Bidisperse Repulsive  
Colloids in Two Dimensional (2D) Space," AIChE Annual  
Meeting, Philadelphia, PA, November (2008).

Uline, M., and Corti, D. S., "Molecular Dynamics in the  
Isothermal-Isobaric Ensemble: Discontinuous Potentials,"  
AIChE National Meeting, Philadelphia, PA, November  
(2008).

Sturtevant, B., and Corti, D. S., "Computational Studies of  
Colloidal Dynamics in Entropic Force Fields," AIChE  
National Meeting, Philadelphia, PA, November (2008).

Uline, M., and Corti, D. S., "New Picture of First-Order Phase  
Transitions in Metastable Fluids: Homogeneous Nucleation  
and Growth," AIChE National Meeting, Philadelphia, PA,  
November (2008).





## W. Nicholas Delgass

Ph. D., Stanford, 1969

### Maxine Spencer Nichols Professor

#### Research Areas

Heterogeneous catalysis, catalyst design by *Discovery Informatics*, olefin polymerization, water gas shift reaction, propylene epoxidation over Au nanoparticles, spectroscopy of surfaces, biofuels

#### Selected Professional Activities

Director, Catalysis and Reaction Engineering Division, AIChE  
Editorial Board, *Journal of Catalysis*  
Member of the External Advisory Board for the Institute for Environmental Catalysis, Northwestern University

#### Selected Invited Lectures

"Toward the Design of Water Gas Shift Catalysts,"  
Philadelphia Catalysis Club, March (2009).

"Toward the Design of Single Site Olefin  
Polymerization Catalysts," Workshop on Grand  
Challenges in Catalysis, UCSB, Santa Barbara, CA,  
August (2008).

#### Selected Publications

Getman, R. B., Schneider, W. F., Delgass, W. N., and  
Ribeiro, F. H., "Oxygen-Coverage Effects on Molecular  
Dissociations at a Pt Metal Surface," *Phys. Rev. Letters*,  
**102**, 076101 (2009).

Hsu, S.-H., Stamatis, S. D., Caruthers, J. M., Delgass,  
W. N., Venkatasubramanian, V., Blau, G. E., Lasinski,  
M., Orcun, S., "A Bayesian Framework for Building  
Kinetic Models of Catalytic Systems," *Industrial and  
Engineering Chemistry Research*, **48**, 4768-4790 (2009).

Basu, S., Brockman, A., Gagare, P., Zheng, Y.,  
Ramachandran, P. V., Delgass, W. N., Gore, J.,  
"Chemical Kinetics of Ru-Catalyzed Ammonia Borane  
Hydrolysis," *J. Power Sources*, **188**, 238-243 (2009).

Phatak A. A., Delgass, W. N., Ribeiro, F. H., and  
Schneider, W. F., "DFT Comparison of Water  
Dissociation Steps on Cu, Au, Ni, Pd and Pt," *J. Phys.  
Chem. C*, **113**, 9698-9709 (2009).

Joshi, Y. V., Ghosh, P., Venkataraman, P. S., Delgass,  
W. N., and Thomson, K. T., "Electronic Descriptors for  
the Adsorption Energies of Sulfur containing Molecules  
on Co/MoS<sub>2</sub> using DFT Calculations," *J. Phys. Chem.  
C*, **113**, 9698-9709 (2009).

Joshi, A. M., Taylor, B., Cumarantunge, L., Thomson,  
K. T., and W.N. Delgass, "Propylene Epoxidation by O<sub>2</sub>  
+ H<sub>2</sub> over Au Nanoparticles on Ti-Nanoporous  
Supports," *Mechanisms in Homogeneous and  
Heterogeneous Epoxidation Catalysis*, S.T. Oyama, Ed,  
Elsevier, 315-338 (2008).

Kromer, B., Cao, L., Cumarantunge, L., Mulla, S. S.,  
Ratts, J.L., Yezerets, A., Currier, N. W., Ribeiro, F. H.,  
Delgass, W.N., Caruthers, J. M., "Modeling NO  
Oxidation and NOx Storage on Pt/BaO/Al<sub>2</sub>O<sub>3</sub> NOx  
Traps," *Catalysis Today*, **136**, 93-103 (2008).

Mulla, S. S., Chaugule, S. S., Yezerets, A., Currier, N.  
W., Delgass, W. N., Ribeiro, F. H., "Regeneration of  
Pt/BaO/Al<sub>2</sub>O<sub>3</sub> Lean NOx Trap Catalysts with H<sub>2</sub>,"  
*Catalysis Today*, **136**, 136-145 (2008).

Cao, L., Ratts, J., Yezerets, A., Currier, N.W., Caruthers,  
J. M., Ribeiro, F.H., and Delgass, W. N. "Kinetic  
Modeling of NOx Storage-Reduction on Pt/BaO/Al<sub>2</sub>O<sub>3</sub>  
Monolith Catalysts," *I&EC Research*, **47**, 9006-9017  
(2008).

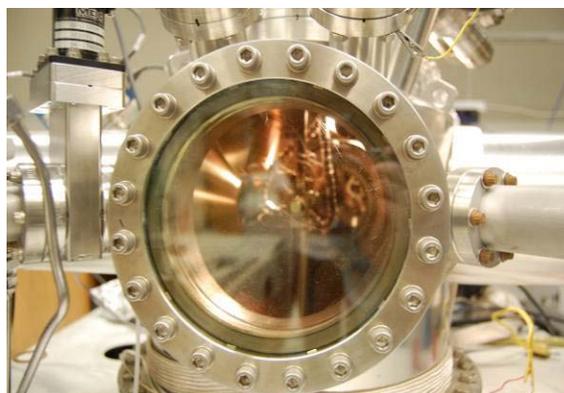
Joshi, Y. V., Ghosh, P., Daage, M., Delgass, W. N.,  
"Support Effects in HDS Catalysts: DFT Analysis of  
Thiolysis and Hydrolysis Energies of Metal-Support  
Linkages," *J. Catal.*, **257**, 71-80 (2008).

Bollmann, L., Ratts, J. L., Joshi, A. M., Williams, W. D.,  
Pazmino, J., Y Joshi, Y.V., Miller, J. T., Kropf, A. J.,  
Delgass, W. N., Ribeiro, F. H., "Effect of Zn Addition  
on the Water-Gas Shift Reaction over Supported  
Palladium Catalysts," *J. Catal.*, **257**, 43-54 (2008).

Manz, T. A., Sharma, S., Phomphrai, K., Novstrup, K.  
A., Fenwick, A. E., Fanwick, P.E., Medvedev, G. A.,  
Abu-Omar, M. M., Delgass, W. N., Thomson, K. T., and  
Caruthers, J. M., "Quantitative Effects of Ion Pairing and  
Sterics on Chain Propagation Kinetics for 1-hexene  
Polymerization Catalyzed by Mixed Cp<sup>+</sup>/ARO  
Complexes," *Organometallics*, **27**, 5504-5520 (2008).

#### Selected Conference Presentation

Invited: "Successes and Prospects for Catalysis and  
Reaction Engineering, Centennial Super Session, AIChE  
Annual Meeting, Philadelphia, PA, November (2008).





## Elias I. Franses

Ph. D., Minnesota, 1979

### Professor

#### Research Areas

Adsorption and Tension Equilibria and Dynamics of Surfactants and Proteins at Interfaces, Adsorption and Transport of Lung Surfactants and their Roles in Alveolar Respiratory Diseases. Sorbents and Sorbent-Solvent Sorbate Interactions of Chiral Molecules for Bioseparations of Enantiomers, Lipid/Protein Interactions in Solutions and at Surfaces

#### Selected Invited Lectures

"Dynamics, Direct Probing, and Mechanisms of Adsorption of Lipids and Serum Proteins at Air-Water Interfaces.

Implications for Alveolar Lung Diseases." National Cheng Kung University, Tainan, Taiwan, November (2008).

#### Selected Publications

Park, Y., Kim, S.H., Matalon, S., Wang, N.-H. L., and Franses, E.I., "Effect of Phosphate Salts Concentrations, Supporting Electrolytes, and Calcium Phosphate Salt Precipitation on the pH of Phosphate Buffer Solutions," *Fluid Phase Equilibria*, **278**, 76-84 (2009).

Kasat, R.B., Wee, S. Y., Loh, J. X., Wang, N.-H.L., and Franses, E.I., "Effect of the Solute Molecular Structure on Its Enantioselectivity for Cellulose Tris (3,5 - dimethylphenylcarbamate)," *J. Chromatogr. B*, **875**, 81-92 (2008); invited paper for special issue in honor of Professor Lindner.

Kim, S. H., Park, Y., Matalon, S., and Franses, E.I., "Effect of Buffer Composition and Preparation Protocol on the Dispersion Stability and Interfacial Behavior of Aqueous DPPC Dispersions," *Colloids Surf. B*, **67**, 253-260 (2008).

#### Selected Conference Presentations

Keynote: "Dispersion Stability and Dynamic Surface Tension of Aqueous Lipid/Protein Dispersions," 13th IACIS

International Conference on Surface and Colloid Science and the 83rd ACS Colloid and Surface Science Symposium, Columbia University, New York, NY, June (2009).

Lozano, N., Pinazo, A., Pons, R., Perez, L., and Franses, E.I., "Phase and Surface Behavior of Aqueous Dispersions and Monolayers of Dialkylglycerol Arginine-Based Surfactants," 17th International Symposium on Surfactants on Solution, Berlin, Germany, August (2008).

Plenary: Franses, E.I., Kasat, R.B., and Wang, N.-H. L., "Elucidation of Chiral Discrimination Mechanisms for Separations of Enantiomers Using Polysaccharide-Based Sorbents," International Symposium on Nano-Science and Technology, Tainan Taiwan, November (2008).

Kim, S., Park, Y., and Franses, E.I., "Dynamic Surface Tensions of Dipalmitoylphosphatidylcholine (DPPC) Dispersions at Physiological Conditions," AIChE Annual Meeting, Philadelphia, Pennsylvania, (November 2008).

Invited talk at The Symposium Honoring H. Ted Davis, Franses, E.I., Kasat, R.B., and Wang, N.-H. L., "Elucidating Chiral Discrimination Mechanisms in Polysaccharide-Based Sorbents using Experimental Probing and Molecular Simulation," AIChE Annual Meeting, Philadelphia, PA, November (2008).



## Robert E. Hannemann

M.D., Indiana University, 1959

### Visiting Professor

#### Research Areas

Healthcare Engineering, Modeling Erythrocyte size distribution for evaluation of Lukemia chemotherapy, serum bilirubin determination by skin reflectance, surfactant in respiratory distress syndrome treatment.

#### Selected Professional Activities

Executive Committee and Liaison for the Center for Assistive Technology, Regenstrief Center on Healthcare Engineering, Purdue University

Chair, Healthcare Engineering Signature Area, Purdue University

Board of Directors, National Center for Missing and Exploited Children

#### Selected Publications

Sherer, E., Hannemann, R.E., Rundell, A., Ramkrishna, D., "Application of Stochastic Equations of Population Balances to Sterilization Processes," *Chemical Engineering Science*, (in press).

Coen, P.M., Flynn, M.G., Markofski, M.M., Pence, B.O., and Hannemann, R.E., "Adding Exercise Training to Rosuvastatin Treatment: Influence on Serum Lipids and Biomarkers of Muscle and Liver Damage," *Metabolism Clinical and Experimental*, (in press).



## Michael T. Harris

Ph. D., University of Tennessee – Knoxville, 1992

**Professor and  
Associate Dean of Undergraduate Education**

**Fellow, AIChE (2009)**

### Research Areas

**Nanoparticle Technology, Synthesis of Nanowires and Nanotubes, Micropatterning,  
Protein Crystallization, Interfacial and Transport Phenomena**

### Selected Professional Activities

Engineering Advisory Council, Mississippi State University  
Associate Editor, *Journal of Nanomaterials*  
Associate Editor, *Chemical Engineering Letters*  
Committee on Minority Affairs, American Chemical Society  
Chair, AIChE Minority Affairs Committee

### Selected Publications

Hu, M. Z., Khatri, L. and Harris, M. T., "Monodispersed Ultrafine Zeolite Crystal Particles by Microwave Hydrothermal Synthesis," *Ceramic Transactions*, **208**, 89-108 (2009).

Zhao, Y. Y., Li, F., Carvajal, M. T., and Harris, M. T., "Interactions between Bovine Albumin and Alginate: An Evaluation of Alginate as an Encapsulation Carrier," *J. Colloid Interface Sci.*, **332**(2), 345-353 (2009).

Royston, E.S., Harris, M. T., and Culver, J. N. , "Preparation of silica stabilized Tobacco mosaic virus templates for the production of metal and layered nanoparticles," *J. Colloid Interface Sci.* **332**(2), 402-407 (2009).

Lee, S. Y., Lim, J.S., Royston, E. S., Culver, J. N. and Harris, M. T., "Flocculation of Tobacco Mosaic Virus in LiCl-Alcohol-Water Solutions," *J. Colloid Interface Sci.*, **324**, 92-93 (2008).

### Selected Conference Presentations

Li, F., Zhao, Y. Y., and Harris, M. T., "Evaluation of Sodium Alginate for Protein Drug Delivery," 04I06, Student Poster Competition, AIChE Annual Meeting, Philadelphia, PA, November (2008).

Zhu, Q., Beard, J., Taylor, L. and Harris, M. T., "Crystallization Behavior and Microstructural Characterization of Drug-Polyethylene Glycol Dispersions," 187h, AIChE Annual Meeting, Philadelphia, PA, November (2008).

Lim, J. S., Culver, J. N. and Harris, M. T., "Gold and Palladium Deposition on the Genetically Engineered Tobacco Mosaic Virus with Controlled Metal Loading," 304c, AIChE Annual Meeting, Philadelphia, PA, November (2008).

Collins, R. T., Jones, J. J., Harris, M. T. and Basaran, O. A., "Electrohydrodynamic Tip-Streaming and Emission of Charged Drops from Liquid Cones," 417c, AIChE Annual Meeting, Philadelphia, PA, November (2008).

Sung, P. F., Hall, T. T. and Harris, M. T., "Determining the Density and Moisture Content of Powders Using Microwave Dielectric Spectroscopy," 484a, AIChE Annual Meeting, Philadelphia, PA, November (2008).





## Hugh W. Hillhouse

Ph. D., University of Massachusetts, 2000

Associate Professor

Sharma Medal from the Indian Chemical Engineering Congress (2008)  
Purdue University Faculty Scholar (2009-2014)

### Research Areas

Solar Energy Conversion, Nanomaterials, Colloidal & Interfacial Phenomena

### Selected Professional Activities

Editorial Advisory Board for *Chemistry of Materials*

### Selected Invited Lectures

"The Road to Low-Cost and High-Efficiency Solar Cells via Self-Assembled Nanomaterials," University of Colorado, Chemical Engineering Departmental Seminar, Boulder CO, April (2009).

"The Road to Low-Cost and High-Efficiency Solar Cells via Self-Assembled Nanomaterials," Colorado School of Mines, Chemical Engineering Departmental Seminar, Golden CO, January (2009).

Award Lecture: "The Road to Low-Cost and High-Efficiency Solar Cells via Nanomaterials," CHEMCON 2008, DOST Prof. S. K. Sharma Medal and Distinguished Speaker Award, Panjab University, Chandigarh, India, December (2008).

Plenary Speaker: "The Road to Low-Cost and High-Efficiency Solar Cells via Self-Assembled Nanomaterials," AIChE Annual Meeting, Materials Engineering and Science Division Plenary Session, Philadelphia, PA, November (2008).

### Selected Publications

Khlebnikov, S. and Hillhouse, H.W., "Electronic Structure of Double-Gyroid Nanostructured Semiconductors: Perspectives for Carrier Multiplication Solar Cells," *Phys. Rev. B*, **80**, 115316 (2009).

Guo, Q.J., Hillhouse, H.W., Agrawal, R., "Synthesis of Cu<sub>2</sub>ZnSnS<sub>4</sub> Nanocrystal Ink and Its Use for Solar Cells," *Journal of the American Chemical Society*, **131** (33), 11672-11673 (2009).

Guo, Q.J., Ford, G.M., Hillhouse, H.W., Agrawal, R., "Sulfide Nanocrystal Inks for Dense Cu(In<sub>1-x</sub>Ga<sub>x</sub>)(S<sub>1-y</sub>Se<sub>y</sub>)<sub>2</sub> Absorber Films and Their Photovoltaic Performance," *Nano Letters*, **9**, 8 3060-3065 (2009).

Dunphy, D.R., Alam, T.M., Tate, M.P., Hillhouse, H.W., Smarsly, B., Collord, A.D., Carnes, E., Baca, H.K., Köhn, R., Sprung, M., Wang, J., Brinker, C.J., "Characterization of Lipid-Templated Silica and Hybrid Thin Film Mesophases by Grazing Incidence Small-Angle X-Ray Scattering," *Langmuir* **25**, 9500-9509 (2009).

Invited Review Article, Hillhouse, H.W. & Beard, M.C., "Solar Cells from Colloidal Nanocrystals: Fundamentals, Materials, Devices, and Economics," *Current Opinion in Colloid & Interface Science*, **14**, 245-259 (2009).

Guo, Q.J., Kim, S.J., Kar, M., Shafarman, W.N., Birkmire, R.W., Stach, E.A., Agrawal, R., Hillhouse, H.W., "Development of a CuInSe<sub>2</sub> Nanocrystal Ink for Low-Cost Solar Cells," *Nano Letters* **8**, 9, 2982-2987 (2008).

Cheng, X., Dehen, C.J., Simpson, G.J., Tate, M.P., Hillhouse, H.W., Akkus, O., "An Electrochemically Induced Collagen Assembly Process for Synthesis of Biomimetic Tendon-like Materials," *Biomaterials*, **29**, 22, 3278-3288 (2008).

Maruo, T., Tanaka, S., Hillhouse, H.W., Nishiyama, N., Egashira, Y., Ueyama, K., "Disordered mesoporous silica low-k thin films prepared by vapor deposition into a triblock copolymer template film," *Thin Solid Films*, **516**, 15, 4771-4776 (2008).

### Intellectual Property

Guo, Q.J., Agrawal, R., Hillhouse, H.W., "Synthesis of Multinary Chalcogenide Nanoparticles Comprising of Cu, Zn, Sn, S, and Se," U.S. Provisional Patent Application.

Guo, Q.J., Agrawal, R., Hillhouse, H.W., "I-III-VI<sub>2</sub> Absorber Films Using Nanoparticle Inks," U.S. Provisional Patent Application.

Kar M, Agrawal, R., Hillhouse, H.W., "Chemical Liquid Deposition and Solution Phase Chalcogenization for the Formation of Multinary Metal Chalcogenide Thin Films," U.S. Provisional Patent Application.

Guo Q.J., Agrawal, R., Hillhouse, H.W., "Selenization of Precursor Layer Containing CuInS<sub>2</sub> Nanoparticles," U.S. Provisional Patent Application.





## **Nancy W. Y. Ho**

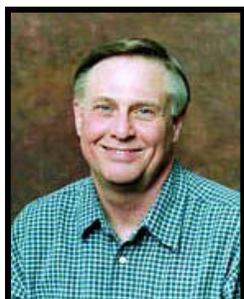
Ph. D., Purdue University, Molecular Biology

### **Research Professor**

**Senior Research Scientist and Group Leader of Molecular Genetics Group  
Laboratory of Renewable Resources Engineering (LORRE)**

### **Research Areas**

**Genetic engineering of the *Saccharomyces* yeast to convert sugars from cellulosic biomass to ethanol**



## **R. Neal Houze**

Ph. D., University of Houston, 1968

### **Professor**

### **Selected Professional Activities**

Purdue University Senate, Superior Student Committee  
Ombudsman for College of Engineering, Purdue University  
Interdisciplinary Engineering Committee, College of Engineering, Purdue University



## **Sangtae Kim**

Ph. D., Princeton, 1983

**Donald W. Fedderson Distinguished Professor**

**Member, National Academy of Engineering**

### **Research Areas**

**Pharmaceutical Informatics; Bioinformatics, Cheminformatics, Systems Biology;  
Computational Microfluidics and Nanofluidics; Radio Frequency Identification (RFID) and  
Enabling Information Technologies**

### **Selected Professional Activities**

FDA Science Board Working Group, Chair – IT Subgroup  
Vice Chair, World Technology Evaluation Center (WTEC)

### **Advisory Boards (academic)**

Dept. of Chemical Engineering, University of California Santa Barbara  
College of Engineering, Illinois Institute of Technology  
National University of Singapore, Graduate School Integrative Studies Program  
Dept. of Chemical Engineering, Tennessee Tech. University.

### **Selected Invited Lectures**

Cockrell School of Engineering Lectureship, Univ. of Texas – Austin, April (2009).

College of Computing and Information Sciences, Rochester Institute of Technology, April (2009).

Dept. of Chemical Engineering, Tufts University, Dec. 8, 2008

### **Selected Publications**

Nandigam, R., Kim, S., Singh, J., and Chuaqui, C., "Position Specific Interaction Dependent Scoring Technique for Virtual Screening Based on Weighted Protein-Ligand Interaction Fingerprint Profiles," *J. Chem. Inf. Model.*, **49**, 1185-1192 (2009).

Nandigam, R., Evans, D., Erickson, J., Kim, S., and Sutherland, J., "Predicting the Accuracy of Ligand Overlap Models with Random Forest Models," *J. Chem. Inf. Model.*, **48**, 2386-2394 (2008).



## James D. Litster

Ph. D., University of Queensland, 1985

**Professor of Chemical Engineering and Industrial and Physical Pharmacy**  
**Director of Graduate Studies**  
**Achievement Award, 9th International Agglomeration Symposium/4th International Granulation Workshop, UK (2009)**

### Research Areas

**Particle Design and Formulation, Granulation and Agglomeration, Crystallization of Bioactives, Engineering Education**

### Selected Professional Activities

Member, Solae LLC (St Louis) Scientific Advisory Board  
Member, Board of the Co-operative Research Centre for Rail  
Consultant, International Fine Particle Research Institute  
Chair, Mining Education Australia Board  
International Organizing Committee, ECI Conference on Particulate Processes in the Pharmaceutical Industry II, Puerto Rico, February (2008)

### Selected Invited Lectures

“Quantitative Simulation of Wet Granulation for Pharmaceutical Processing,” Food and Drug Administration, Maryland, March (2009).

“Towards Quantitative Engineering Design of Wet Granulation for Pharmaceutical Processing,” Eli Lilly, Indianapolis, IN, January (2009).

“Towards Quantitative Engineering Design of Wet Granulation for Pharmaceutical Processing,” Department of Chemical Engineering, Monash University, Australia, August (2008).

### Selected Publications

Glaser, T., Sanders, C. F.W., Wang, F.Y., Cameron, I. T. Litster, J.D., Poon, M.-H.J., Ramachandran, R., Immanuel, C. D., Doyle, F. J. III, “Model predictive control of continuous drum granulation,” *Journal of Process Control*, **19**, 615-622. (2009).

Ramachandran, R., Immanuel, C. D., Stepanek, F., J Litster, J.D , Doyle, F. J. III. , “A mechanistic model for breakage in population balances of granulation: Theoretical kernel development and experimental validation,” *Chemical Engineering Research and Design Part A*, **87**, 598-614. (2009)

Poon, J. M.,-H., Ramachandran, R., Sanders C., Glaser, T., Immanuel, C. D., Doyle, F. J. III, Litster J. D., Wang, F., Cameron, I. T. and Stepanek, F., “Experimental Validation Studies on a Multi-Dimensional and Multi-Scale Population Balance Model of Batch Granulation,” *Chemical Engineering Science*, **64**, 775-786. (2009).

Tait, S., White, E. T., and Litster, J. D., “A Study on Nucleation for Protein Crystallization in Mixed Vessels,” *Cryst. Growth Des.*, **9**, 2198-2206 (2009).

Liua, L. X., Smith, R., and Litster, J.D, “Wet granule breakage in a Breakage Only High-hear Mixer: Effect of formulation properties on breakage behavior,” *Powder Technology*, **189**, 158–164 (2009).

Liua, L. X., Marzianob, I., Benthamb, A. C., Litster J. D., Whitea, E.T. and Howesa, T., “Effect of particle properties on the flowability of ibuprofen powders,” *Int. J. Pharmaceutics*, **362**, 109-117, (2008).

Ramachandran, R., Poon, J. M.,-H., Sanders, C., Glaser, T., Cameron, I., Doyle, F. J. III, Immanuel, C. D., Litster, J. D. Stepanek, F. and Wang, F., “Experimental Studies on Distributions of Granule Size, Binder Content and Porosity in Batch Drum Granulation: Inferences on process modelling requirements and process sensitivities,” *Powder Tech.*, **188**, 89-101 (2008).

Tait, S., White, E.T. and Litster, J.D., “Mechanical Characterization of Protein Crystals,” *Particle and Particle Systems Characterization*, **25**, 266-276 (2008).

Freireich, B., Litster, J. D., Wassgren, C., “Using the discrete element method to predict collision-scale behavior: A sensitivity analysis,” *Chemical Engineering Science*, (in press).

Dombrowski, R.D., Wagner, N.J., He Y.H. and Litster, J.D., “Modeling the Crystallization of Proteins and Small Organic Molecules in Nanoliter Drops,” *AIChE Journal*, (in press).

### Selected Conference Presentations

Invited Presentation: “Particle Attribute Control through Wet Granulation Processes,” Molecules, Materials and Medicines, Santa Barbara, CA, May (2009).

Plenary: “Quantitative Simulation of Wet Granulation for Pharmaceutical Processing,” 1st Asian Pharmaceuticals Technology Arden House Conference, Particle and Powder Technologies, Beijing, China, November (2008).

Plenary: “Population Balance Modeling for Wet Granulation Design,” Particle Formation Symposium, ETH, Zurich, Switzerland, July (2008).

### Book chapters

Snow, R.H., Allen, T., Ennis, B.J., Litster, J.D., Section 20. “Size Reduction and Size Enlargement” in Perry’s Chemical Engineers Handbook, D. Green (ed.), McGraw-Hill, (98pp). (2008).





**Julie C. Liu**  
Ph. D., Caltech, 2006

**Assistant Professor**

**Research Areas**  
Biomaterials, Tissue Engineering, Protein Engineering

### Professional Activities

Review panel, NSF Biomedical Engineering  
Review panel, NSF Biotransport

### Selected Invited Lectures

“Understanding Bone Formation: The Roles of Runx2 Promoter Utilization and Pharmacologic Targeting,” Biomedical Engineering, Indiana University-Purdue University (IUPUI), Indianapolis, IN, October (2008).

### Selected Publications

Jeong, J.-H., Jin, J.-S., Kim, H.-N., Kang, S.-M., Liu, J.C., Lengner, C.J., Otto, F., Mundlos, S., Stein, J.L., van Wijnen, A.J., Lian, J.B., Stein, G.S., and Choi, J.-Y., “Expression of Runx2 Transcription Factor in Non-Skeletal Tissues, Sperm and Brain,” *Journal of Cellular Physiology*, **217**, 511-517 (2008).

Liu, J.C. and Tirrell, D.A., “Cell Response to RGD Density in Crosslinked Artificial Extracellular Matrix Protein Films,” *Biomacromolecules*, **9**, 2984-2988 (2008).

### Selected Conference Presentations

Liu, J.C., “Modulating Endothelial Cell Response with Artificial Extracellular Matrix Proteins Designed for Application in Small Diameter Vascular Grafts,” annual meeting of the Society for Biomaterials, Biomimetic Materials, San Antonio, TX, April (2009).

Liu, J.C. and Tirrell, D.A., “Modulating Endothelial Cell Response to Crosslinked Artificial Extracellular Matrix Proteins,” Session 579: Biomaterial-Cell Interactions in Tissue Engineering I, 579d AICHE Annual meeting, Philadelphia, PA, November (2008).

Liu, J.C., Beatty, K.E., Xie, F., Dieterich, D.C., Schuman, E.M., Wang, Q., and Tirrell, D.A., “Fluorescence Visualization of Newly Synthesized Proteins in Mammalian Cells,” Session 393: Advances in Proteomics: New Technologies, 393d, AICHE Annual meeting, Philadelphia, PA, November (2008).

Jones, M.D., Liu, J.C., Schoonmaker, J., Barthel, T.K., Mulay, S. Bouxsein, M.L., Stein, G.S., Mukherjee, S. and Lian, J.B., “Bortezomib, a Proteasome Inhibitor, Prevents Metastatic Breast Cancer Osteolysis and Reduces Mammary Fat Pad Tumor Growth in Mice,” annual meeting of the American Society for Bone and Mineral Research, Montreal, Canada, September (2008).





## John A. Morgan

Ph. D., Rice, 1999

Associate Professor

**Kothari Visiting Professorship in ChE  
University of Mumbai, Institute of Chemical Technology (2009)**

**Research Areas: Metabolic Engineering, Biocatalysis**

### Selected Professional Activities

Session Chair, "Novel Methods and Analysis of Biochemical High Throughput Screening" AICHE Annual Meeting, Philadelphia, PA, November (2008).

Session Co-Chair "Protein Engineering III" AICHE Annual Meeting, Philadelphia, PA, November (2008).

Session Co-Chair "Molecular Modeling of Biophysical Processes II" AICHE Annual Meeting, Philadelphia, PA, November (2008).

2008 AICHE Division 15c Programming Chair

Associate Editor, Bioprocess and Biosystems Engineering

### Selected Publications

Boyle, N., Shastri, A. and Morgan, J., "Network Stoichiometry," *Plant Metabolic Networks*, J. Schwender, Ed. Springer, New York 211-243 (2009).

Colón, A.M., Morgan, J.A., Dudareva, N. and Rhodes, D., "Application of Dynamic Flux Analysis in Plant Metabolic Networks," *Plant Metabolic Networks*, J. Schwender, Ed. Springer, New York 285-305 (2009).

Boyle, N. and Morgan, J.A., "Flux balance analysis of primary metabolism," *Chlamydomonas reinhardtii*. *BMC Syst Biol.*, **3**, 4 (2009).

Song, H.S., Morgan, J.A. and Ramkrishna, D., "Systematic development of hybrid cybernetic models: Application to recombinant yeast co-consuming glucose and xylose," *Biotechnology and Bioengineering*, **103**, 984-1002 (2009).

Werner, S. and Morgan, J.A., "Heterologous Expression of a Flavonoid Glucosyltransferase in Yeast for Whole-cell Biocatalysis," *J. Biotechnol.*, **142**, 233-241 (2009).

### Selected Conference Presentations

Sengupta, N. and Morgan, J.A., "Flux Analysis of CHO Cell Metabolism for Recombinant Protein Production," 2nd International Conference on Biomolecular Engineering Santa Barbara, CA, January (2009).

Young, J.A., Shastri, A., Stephanopoulos, G., Morgan, J.A., "Isotopic Nonstationary <sup>13</sup>C Flux Analysis of Synechocystis Photoautotrophic Metabolism," AICHE Annual Meeting, Philadelphia, PA, November (2008).

Song, H.-S., J. A. Morgan, N.W.Y. Ho, A. Varma, and D. Ramkrishna, "Identification of Potential Target Pathways of Recombinant Yeast for Increasing Bioethanol Productivity: In Silico Analysis Using Cybernetic Models," AICHE Annual Meeting, Philadelphia, PA, November (2008).

Song, H.-S., J. A. Morgan, N.W.Y. Ho, A. Varma, and D. Ramkrishna, "Optimization of Batch and Continuous Fermenters for Increasing Bioethanol Productivity Using Hybrid Cybernetic Models," AICHE Annual Meeting, Philadelphia, PA, November (2008).

Werner, S. and Morgan, J.A. "Expression of a flavonoid glycosyltransferase in yeast for whole cell biocatalysis" International Biotechnology Symposium, Dalian, China, October (2008).

Song, H.-S., J. A. Morgan, N.W.Y. Ho, A. Varma, and D. Ramkrishna, "More Ethanol in Recombinant Yeast from Modeling: Towards Pathway Modifications Using Hybrid Cybernetic Models," Metabolic Engineering VII, Health and Sustainability, Puerto Vallarta, Mexico, September (2008).

Invited: Morgan, J.A., Shastri, A., Young, J., and Stephanopoulos, G., "Quantifying phenotype in photoautotrophic systems using isotopically nonstationary <sup>13</sup>C metabolic flux analysis," Metabolic Engineering VII: Puerto Vallarta, Mexico, September (2008).





**Joseph F. Pekny**  
Ph. D., Carnegie Mellon University, 1989

**Professor**  
**Interim Head, School of Industrial Engineering**

**Research Areas**  
Systems analysis; combinatorial optimization; supply chain management, planning and scheduling systems; pharmaceutical pipeline management; model-based and data driven management; systems analysis and decision models in healthcare engineering, real-time decision systems

**Selected Publications**

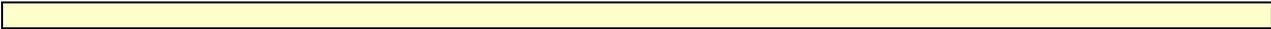
Mathias Hodge, B., Pekny, J. F., and Reklaitis, G. V. , “A Multi-Paradigm Energy Model for Liquid Natural Gas Analysis,” *Proceedings of the 1st Annual Gas Processing Symposium*, Alfadala, H., Reklaitis, G. V., and El-Halwagi, M. M. (editors), Elsevier (2009).

Jung, J. Y., Blau, G., Pekny, J. F., Reklaitis, G. V., and Eversdyk, D., “Integrated Safety Stock Management for Multi-Stage Supply Chains under Production Capacity Constraints,” *Computers and Chemical Engineering*, **32**, 2570-2581 (2008).

Varma, V., Pekny, J. F., Blau, G., and Reklaitis, G. V., “A Framework for Addressing Stochastic and Combinatorial Aspects of Scheduling and Resource Allocation in Pharmaceutical R&D Pipelines,” *Computers and Chemical Engineering*, **32**, 1000-1015 (2008).

**Selected Conference Presentations**

“The Implication of Continuing Life Science Advances on the Pharmaceutical Industry and Portfolio/Pipeline Management,” Drug Information Association (DIA) Conference, San Diego, CA, June (2009).



**R. Byron Pipes**  
Ph. D., University of Texas – Arlington, 1972

**John Leighton Bray Distinguished Professor of Engineering**  
**Director, Purdue Institute for Defense Innovation**

**Member, National Academy of Engineering**

**Research Areas**  
Application of nanotechnology to engineering disciplines including aerospace, composite materials and polymer science and engineering

**Selected Professional Activities**

Fellow, American Society of Mechanical Engineers

Fellow, Society for Advanced Materials and Process Engineering

Member, NRC Committee Panel on Building and Fire Research

**Selected Publications**

Buchanan, D.L., Gosse, J.H., Wollschlager, J.A., Ritchey, A., Pipes, R.B., “Micromechanical Enhancement of the Macroscopic Strain State for Advanced Composite Materials,” *Composites Science and Technology*, **69**, 1974-1978 (2009).

Strus, M.C., Cano, C., Pipes, R.B., Nguyen, C., and Raman, A., “Interfacial Energy between Carbon Nanotubes and Polymers from Nanoscale Peel Testing the Atomic Force Microscope,” *Composites Science and Technology*, **69**, 1580-1586 (2009).



## Doraiswami Ramkrishna

Ph. D., University of Minnesota, 1965

H. C. Peffer Distinguished Professor

Member, National Academy of Engineering

Platinum Award, Institute of Chemical Technology,  
University of Mumbai (2008)

### Research Areas

Applied Mathematics, Dispersed phase systems, Biochemical engineering, Chemical reaction engineering

### Selected Professional Activities

Fellow, AIChE

### Selected Invited Lectures

"On Modeling Metabolic Systems. The Cybernetic Route,"  
Pacific Northwest National Laboratories, Pasco, WA, March  
(2009).

"On Modeling Metabolic Systems. The Cybernetic Route,"  
Bristol Myers Squibb, NJ, February (2009).

"On Hybrid Cybernetic Models of Metabolic Systems,"  
University of Ghent, Ghent, Belgium, July (2008).

Invited Talk in Symposium Honoring Ted Davis: "On the  
Computation of Spectra of Spatially Varying Convective-  
Diffusion Operators," Bohmann, A., Nere, N., Ramkrishna,  
D., Kienle, A., Paper #564a, AIChE Annual Meeting,  
Philadelphia, PA, November (2008).

Invited Talk in Memory of Rutherford Aris, "Monod's Growth  
Kinetics. Is there a Rationale for it?" Paper #295b, AIChE  
Annual Meeting, Philadelphia, PA, November (2008).

Invited Talk in Session on Applied Mathematics in Chemical  
Engineering: Past 100 Years and the Future: "Dynamic  
Models of Biological Systems. A Hotbed for Nonlinear  
Analysis," Paper #154e, AIChE Annual Meeting,  
Philadelphia, PA, November (2008).

### Selected Publications

Sherer, E., Hannemann, R. E., Rundell, A. E. and Ramkrishna,  
D., "Application of Stochastic Equations of Population  
Balances to Sterilization Processes," *Chem. Eng. Sci.*, **64**, 764-  
774 (2009).

Borchert, C., Nere, N., Ramkrishna, D., Voigt, A., and  
Sundmacher, K., "On the Prediction of Crystal Shape  
Distributions in a Steady State Continuous Crystallizer,"  
*Chem. Eng. Sci.*, **64**, 686-696 (2009).

Song, H.-S. and Ramkrishna, D., "When is Quasi-Steady-State  
Approximation Admissible in Metabolic Modeling? When  
Admissible, What Models are Desirable?" *Ind. Eng. Chem.*  
(Joshi issue), **48**, 7976-7985, (2009).

Song, H.-S. and Ramkrishna, D., "Reduction of a Set of  
Elementary Modes by Yield Vector Analysis," *Biotechnol &  
Bioeng.*, **102**, 554-568 (2009).

Young, J. D., Henne, K. L., Morgan, J. A., Konopka, A. E.  
and Ramkrishna, D., "Integrating Cybernetic Modeling with  
Pathway Analysis. A Dynamic Systems Level Description of  
Metabolic Control," *Biotechnol & Bioeng.*, **100**, 542-559  
(2008).

Bhole, M. R., Joshi, J. B., and Ramkrishna, D., "CFD  
simulation of bubble columns incorporating population  
balance modeling," *Chem Eng. Sci.*, **63**, 2267-2282 (2008).

Sherer, E., and Ramkrishna, D., "Stochastic Analysis of Death  
Processes," *Ind. Eng. Chem.* (Nauman issue), **47**, 3430-3437  
(2008).

Kim, J. I., Varner, J. D., and Ramkrishna, D., "A Hybrid  
Cybernetic Model of Anaerobic E. coli GJT001: Combination  
of Elementary Flux Modes and Cybernetic Models," *Biotech.  
Prog.*, **24**, 993-1006 (2008).

Ramkrishna, D. and Song, H.-S., "On a Rationale for Monod's  
Biochemical Growth Kinetics," *Ind. Eng. Chem.* (Varma  
issue), **47**, 9090-9098 (2008).

### Selected Conference Presentations

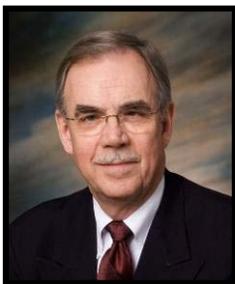
Kim, J. I. and Ramkrishna, D., "A Hybrid Model of E coli and  
Multiple Steady States," Paper presented at ISCRE 20, Kyoto,  
Japan, September (2008).

Song, H.-S., Morgan, J. A., Ho N. W. Y., Varma, A. and  
Ramkrishna, D., "Optimization of Batch and Continuous  
Fermenters for Increasing Bioethanol Productivity using  
Hybrid Cybernetic Models," Paper #677b, AIChE Annual  
Meeting, Philadelphia, PA, November (2008).

Sherer, E., Hannemann, R. E., Rundell, A. E. and Ramkrishna,  
D., "Approximation of Actual Number Densities of Age-  
Structured Cell Division Models using Stochastic Equations of  
Population Balance," Paper #652b, AIChE Annual Meeting,  
Philadelphia, PA, November (2008).

Borchert, C., Nere, N., Voigt, A., Sundmacher, K., and  
Ramkrishna, D., "Modeling the Manipulation of Crystal  
Morphology Distributions," Paper #27b, AIChE Annual  
Meeting, Philadelphia, PA, November (2008).





## Gintaras V. "Rex" Reklaitis

Ph. D., Stanford University, 1969

Edward W. Comings Distinguished Professor

Member, National Academy of Engineering

Festschrift Honoree, *Computers & Chemical Engineering*,  
Vol. 32, Issues 4-5 (2008)

### Research Areas

Process systems engineering, design and operation of batch/semicontinuous systems, enterprise-wide modeling and optimization, applications to pharmaceutical product development, process design and manufacturing

### Selected Professional Activities

Board member, *Computers & Chemical Engineering*  
AICHE 2008 Centennial Steering Committee  
Chair, National Program Committee, Executive Board  
Chair, Centennial Topical Symposium  
National Institute for Pharmaceutical Technology & Education  
Chair, Technology Roadmap Initiative  
Chair, Faculty Committee

### Selected Invited Lectures

"Progress in Decision Support Approaches for Pharmaceutical Product Pipeline Management", Tennessee Tech University, Cookeville, TN, December (2008).

"The Evolution, Growth and Future Perspectives of Operations in Process Systems Engineering", paper 143d, Centennial Session: Computers in Operations, AIChE Annual Meeting, Philadelphia, PA, November (2008)

"Process Operations for Batch and Continuous Processes," paper 177, Reflections on Past Contributions and Future Impact of Process Systems Engineering: Special Session in Honor of the 60th Birthday of George Stephanopoulos, AIChE 2008 Annual, Philadelphia, PA, November (2008).

Plenary: "The First Course: An Introduction to Process Systems", paper 326e, Centennial Session on Education: A Century of Process Principles, AIChE 2008 Annual, Philadelphia, PA, November (2008).

### Selected Publications

Aydogan-Cremaschi, S., Orcun, S., Blau, G., Pekny, J. F., and G.V. Reklaitis, "A Novel Approach for Life Support System Design for Manned Space Missions," *Acta Astronautica*, **65**, 330-346 (2009).

Jung, Y.J., Blau, G., Pekny, J.F. and Reklaitis, G.V., "Integrated Safety Stock Management for multi-stage Supply chain under production capacity constraints," *Computers & Chem Engr*, **32**, 2570-2581 (2008).

Zapata, J.C., Hodge, B.M. and Reklaitis, G.V., "The Multi-mode Resource Constrained Multi-project Scheduling Problem: Alternative Formulations," *AICHE J*, **54**, 8; 2101 (2008).

Kuriyan, K, Catlin, A.C. and Reklaitis, G.V., "pharmaHUB: Building a Virtual Organization for Pharmaceutical Engineering and Science," *J Pharmaceutical Innovation*, (in press).

Zapata, J.C., Pekny, J.F., and Reklaitis, G.V., "Simulation Optimization in support of tactical and strategic enterprise decisions," *Handbook of Production Planning*, K. Kempf, P. Keskinocak and R. Uzsoy (eds), Springer Verlag, (in press).

Lainez, J.M., Puigjaner, L. and Reklaitis, G.V., "Financial and Financial Engineering Considerations in Supply Chain and Product Pipeline Management," *Comput. & Chem Engr*, **33**, (in press).

Kuriyan, K, Catlin, A.C., Hlinak, A., Joglekar, G., Basu, P. and Reklaitis, G.V., "Hub-based Simulations of Unit Operations in Pharmaceutical Manufacturing," *Computer Applications in Engineering Education*, (in press).

### Selected Conference Presentations

"Engineering Research Center for Structured Organic Particulate Synthesis (ERC-SOPS)," Bridging the Gap between Universities and Industry, American Control Conference, St Louis MO, June (2009).

Plenary: "Overview of Role of Mechanistic Models for Drug Product Manufacturing Unit Operations," AAPS Workshop on Utilization of Process Modeling & Advanced Process Control in QbD based Drug Development and Manufacturing, Baltimore, MD, April (2009).

"Successes and challenges for simulation & modeling in Process Systems Engineering," Simulation-Based Engineering & Science, Multi-agency Workshop, WTEC, Washington DC, April (2009).

"Financial and Financial Engineering Considerations in Supply Chain and Product Development Pipeline Management", International Symposium on Foundations of Computer Aided Process Operations, Cambridge, MA, July (2008).





## Fabio H. Ribeiro

Ph. D., Stanford University, 1989

### Professor

**Purdue University Faculty Scholar (2006 – 2011)**

### Research Areas

**Surface Science and Kinetics of Heterogenous Catalytic Reactions**

### Selected Professional Activities

Editorial Board, *Catalysis Letters*

Editorial Board, *Applied Catalysis B: Environmental*

Proposal Review Committee Member, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory

### Selected Publications

Getman, R. B., Schneider, W. F., Smeltz, A. D., Delgass, W. N., and Ribeiro, F. H., "Oxygen Coverage Effects on Molecular Dissociations at a Pt Metal Surface," *Physical Review Letters*, **102**, 076101, (2009).

Phatak, A. A., Delgass, W. N., Ribeiro, F. H., and Schneider, W. F., "DFT Comparison of Water Dissociation Steps on Cu, Au, Ni, Pd and Pt," *Journal of Physical Chemistry C*, **113** (17), 7269-7276, (2009).

Cao, L., Ratts, J. L., Yezerets, A., Currier, N. W., Caruthers, J. M., Ribeiro, F. H., Delgass, W. N., "Modeling of NO<sub>x</sub> Storage-Reduction on Pt/BaO/Al<sub>2</sub>O<sub>3</sub> Monolith Catalysts," *Industrial & Engineering Chemistry Research*, **47** (23), 9006–9017 (2008).

Bollmann, L., Ratts, J. L., Joshi, A. M., Williams, W. D., Pazmino, J., Joshi, Y. V., Miller, J. T., Kropf, J. A., Delgass, W. N., Ribeiro, F. H., "Effect of Zn Addition on the Water-Gas Shift Reaction over Supported Palladium Catalysts," *Journal of Catalysis*, **257**, 43–54, (2008).

Fingland, B. R., Ribeiro, F. H., Miller, J. T., "Simultaneous measurement of x-ray absorption spectra and kinetics: a fixed-bed, plug-flow operando reactor," *Catalysis Letters*, (in press).

### Selected Invited Lectures

"Catalysis on a crowded surface: the role of surface oxygen on NO oxidation over Pt," Lawrence Berkeley National Laboratory, Surface Science and Catalysis Seminar, Berkeley, CA, April (2009).

"Catalysis on a crowded surface: the role of surface oxygen on NO oxidation over Pt," Georgia Institute of Technology, Chemical and Biomolecular Engineering, Atlanta, GA, December (2008).

### Selected Conference Presentations

Williams, W. D., Bollmann, L., Ratts, J. L., Joshi, A. M., Pazmino, J., Joshi, Y. V., Miller, J. T., Delgass, W. N., Ribeiro, F. H., "Bimetallic Pd-Zn and Pd-Fe Supported Catalysts for the Water-Gas Shift Reaction," North American Catalysis Society Meeting, San Francisco, CA, June (2009).

Fingland, B., Ribeiro, F. H., Miller, J. T., "An inexpensive plug flow reactor for X-ray absorption spectroscopy at catalytically relevant reaction conditions," North American Catalysis Society Meeting, San Francisco, CA, June (2009).

Smeltz, A. D., Delgass, W. N., Ribeiro, F. H., Getman, R. B., and Schneider, W. F., "Understanding the Effect of Platinum Particle Size on the Rate of NO Oxidation" NACS 21st NAM, June 7-12 (2009).

Pazmino, J., Miller, J. T., Rioux, R. M., Yezerets, A., Currier, N., Delgass, W. N., and Ribeiro, F. H., "Kinetic studies on the stability of Pt for NO oxidation: effect of sulfur," 21<sup>st</sup> North American Catalysis Society Meeting, San Francisco, CA, June (2009).

Schneider, William F.; Getman, Rachel B.; Phatak, Abhijit; Smeltz, Andrew D.; Delgass, W. N.; Ribeiro, F. H., "First-principles modeling of coverage-dependent rates of catalytic oxidations," 237<sup>th</sup> ACS Annual Meeting, Salt Lake City, UT, United States, March (2009).

Smeltz, A. D., Mulla, S., Zemlyanov, D., and Ribeiro, F. H. "Apparent Structure Sensitivity of the NO Oxidation Reaction on Pt Studied Using Model Catalysts," AIChE National Meeting, Philadelphia, PA, November (2008).

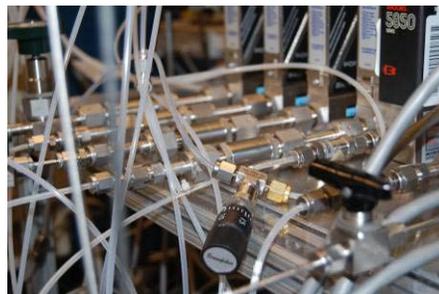
Ratts, J. L., Bollmann, L., Williams, W. D., Pazmino, J., Smeltz, A. D., Joshi, A. M., Miller, J. T., Delgass, W. N., Ribeiro, F. H., "Kinetic and Spectroscopic Investigation of the Water-Gas Shift Reaction on Supported Pt Catalysts," AIChE Annual Meeting, Philadelphia, PA, November (2008).

Bollmann, L., Williams, W. D., Jeffrey T. Miller, W. Delgass, W. N., Ribeiro, F. H., "Water-Gas Shift Reaction on Metal Oxide Supported Palladium Catalysts," AIChE National Meeting, Philadelphia, PA, November (2008).

Singh, N. R., Ribeiro, F. H., Delgass, W. N., and Agrawal, R., "Synergistic Use of Solar Hydrogen with Biomass to Produce Biofuels," AIChE National Meeting, Philadelphia, PA, November (2008).

Renan, O. P., Singh, N. R., Ribeiro, F. H., Delgass, W. N., and Agrawal, R. "Sustainable Fuel for the Brazilian Transportation Sector," AIChE Annual Meeting, AIChE National Meeting, Philadelphia, PA, November (2008).

Singh, N. R., Agrawal, R., Delgass, W. N., and Ribeiro, F. H., "Transportation Fuel in a Fossil Fuel Free World" 2008 AIChE Midwest Regional Conference, Chicago, IL, September (2008).





## Kendall T. Thomson

Ph. D., University of Minnesota, 1999

Associate Professor

Purdue University Faculty Scholar (2008-2013)

### Research Areas

Computational Catalysis Design, Computer-Aided Design of Nanoporous Materials, Ab Initio Molecular Dynamics, Molecular Electronics, Modeling Nano- and Mesoporous Materials

### Selected Professional Activities

Session Chair, "Computational Catalysis II," AIChE Annual Meeting, Philadelphia, November 2008

### Selected Invited Lectures

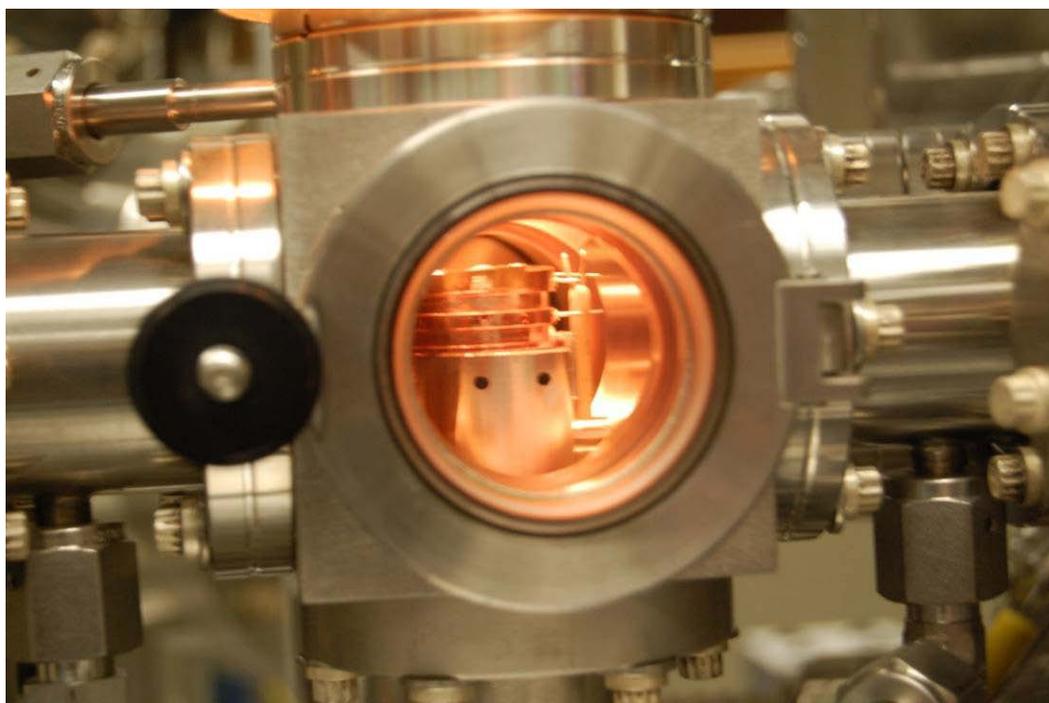
"Ab Initio and DFT-Based Descriptors for Single-Site Polymerization Catalysts," University of Oklahoma, Norman OK., April 2009.

### Selected Publications

Joshi, Y., Ghosh, P., Venkataraman, P. S., Delgass, W. N., and Thomson, K. T., "Electronic Descriptors for the Adsorption Energies of Sulfur-Containing Molecules on Co/MoS<sub>2</sub>, Using DFT Calculations," *Journal of Physical Chemistry C*, **113**, 9698-9709 (2009).

Joshi, Y., and Thomson, K. T., "Brønsted Acid Catalyzed Cyclization of C<sub>7</sub> and C<sub>8</sub> Dienes in HZSM-5: A Hybrid QM/MM Study and Comparison with C<sub>6</sub> Diene Cyclization," *Journal of Physical Chemistry C*, **112**, 12825-12833 (2008).

Manz, T. A., Sharma, S., Phomphrai, K., Novstrup, K. A., Fenwick, A. E., Fanwick, P.E., Medvedev, G. A., Abu-Omar, M. M., Delgass, W. N., Thomson, K. T., and Caruthers, J. M., "Quantitative Effects of Ion Pairing and Sterics on Chain Propagation Kinetics for 1-hexene Polymerization Catalyzed by Mixed Cp'/ARO Complexes," *Organometallics*, **27**, 5504-5520 (2008).





**Arvind Varma**  
Ph. D., Minnesota, 1972

**R. Games Slayter Distinguished Professor and  
Head, School of Chemical Engineering**

**Fellow, AIChE (2008)**  
**Distinguished ChE Alumnus (Inaugural batch of 3), Panjab University (2008)**  
**Distinguished University Alumnus, Panjab University (2008)**  
**Honoree, Festschrift issue, I&EC Research, Volume 47, No. 23 (2008)**

**Research Areas: Chemical and Catalytic Reaction Engineering, Heterogeneous Combustion,  
New Energy Sources, Synthesis of Advanced Materials**

### Selected Professional Activities

Series Editor, *Cambridge Series in Chemical Engineering*,  
Cambridge University Press  
Member of Editorial Board, *International Journal of Petroleum  
Science and Technology*  
Member, Scientific Committee, *International Symposium on  
Chemical Reaction Engineering-20*, Kyoto, Japan, September  
(2008).

### Selected Invited Lectures

Distinguished Chemical Engineering Lecture, University of  
Utah, April, (2009).  
Indian Institute of Technology – Bombay, Mumbai, India,  
January, (2009).  
Tata Chemicals Innovation Center, Pune, India, January,  
(2009).  
CNR Rao Distinguished Lecture and Medal, Chemcon,  
Chandigarh, India December, (2008).

### Selected Publications

Shafirovich, E. and Varma, A., "Underground Coal  
Gasification: A Brief Review of Current Status," *Industrial &  
Engineering Chemistry Research*, **48**, 7865-7875 (2009).

Erri, P. and Varma, A., "Diffusional Effects in NiO Reduction  
Kinetics," *Industrial & Engineering Chemistry Research*, **48**,  
4-6 (2009).

Andrzejak, T., Shafirovich, E., and Varma, A., "On the  
Mechanisms of Titanium Particle Reactions in O<sub>2</sub>/N<sub>2</sub> and  
O<sub>2</sub>/Ar Atmospheres," *Propellants, Explosives, Pyrotechnics*,  
**34**, 53–58 (2009).

Shafirovich, E., and Varma, A., "Metal-CO<sub>2</sub> Propulsion for  
Mars Missions: Current Status and Opportunities," *Journal of  
Propulsion and Power*, **24**, 385-394 (2008).

Andrzejak, T., Shafirovich, E., and Varma, A., "Ignition of  
Iron-Coated and Nickel-Coated Aluminum Particles: Studies  
under Normal and Reduced Gravity Conditions," *Journal of  
Propulsion and Power*, **24**, 805-813 (2008).

Diwan, M., Hanna, D., Shafirovich, E., and Varma, A.,  
"Combustion Wave Propagation in Magnesium/Water  
Mixtures: Experiments and Model," *Chemical Engineering  
Science* (in press).

Diwan, M., Hanna, D., and Varma, A., "Method to Release  
Hydrogen from Ammonia Borane for Portable Fuel Cell  
Applications," *International Journal of Hydrogen Energy* (in  
press).

### Selected Conference Presentations

"Catalytic Oxidation of Glycerol to High-Value Chemical  
Dihydroxyacetone," North American Meeting of the Catalysis  
Society, San Francisco, CA, June (2009).

Invited: "New Methods for Hydrogen Generation from Boron  
Compounds and Water," CNR Rao Distinguished Lecture,  
Chemcon 2008, Chandigarh, India, December (2008).

"Catalytic Oxidation of Glycerol to High-Value Chemicals",  
AIChE Annual Meeting, Philadelphia, PA, November 2008.

"Hydrothermolysis of Ammonia Borane: A Novel Method to  
Generate Hydrogen for Fuel Cells," AIChE Annual Meeting,  
Philadelphia, PA, November (2008).

Invited: "New Methods for Hydrogen Generation from Boron  
Compounds and Water," Prof. R. Aris Memorial session,  
AIChE Annual Meeting, Philadelphia, PA, November 2008.

Invited: "Experimental and Modeling Studies on Combustion  
Wave Propagation in Metal/Water Mixtures for Hydrogen  
Generation," Session in honor of Prof. D. Ramkrishna's 70th  
birthday, AIChE Annual Meeting, Philadelphia, PA,  
November (2008).

"Hydrogen Generation from Boron Compounds Using  
Metal/Water Reactions: Experiments and Model," ISCRE-20  
Meeting, Kyoto, Japan, September (2008).

"New Methods for Hydrogen Generation from Boron  
Compounds and Water," 32nd International Symposium on  
Combustion, Montreal, Canada, August (2008).

"Catalytic Conversion of Glycerol to High-Value Chemicals,"  
ACS Green Chemistry Summer School, Colorado School of  
Mines, Golden, CO, July (2008).

### Intellectual Property

"Method to Generate Hydrogen for Portable Fuel Cell  
Systems," Diwan, M., Shafirovich, E. and Varma, A., US  
Provisional Patent Application.





## Venkat Venkatasubramanian

Ph. D., Cornell, 1984

Professor

Professor of Industrial and Physical Pharmacy (Courtesy)

Computing in Chemical Engineering (CAST) Award, AIChE (2009)

### Research Areas

Pharmaceutical Informatics, Abnormal Events Management and Process Safety, Discovery Informatics for Molecular Products Design, Systems Biology, Complex Adaptive Systems, Artificial Intelligence, Artificial Life, Statistical Mechanics

### Selected Professional Activities

Associate Editor, *Computers and Chemical Engineering*

### Selected Invited Lectures

"Drinking from a Fire Hose: Modeling and Informatics Challenges and Opportunities in Molecular Products Design and Manufacturing," Iowa State University, September (2008).

"Drowning in Data: Modeling and Informatics Challenges and Opportunities in Molecular Products Design and Manufacturing," Oxford University, U.K., July (2008).

"Abnormal Events Management in Complex Engineered Systems," Cambridge University, U.K., July (2008).

### Selected Publications

Venkatasubramanian, V., "Drowning in Data: Informatics and Modeling Challenges in a Data Rich Networked World," Perspective article, *AIChE J.*, **55**(1), 2-8 (2009).

Maurya, M.R., Bornheimer, S.J., Venkatasubramanian, V., and Subramaniam, S., "Mixed-integer nonlinear optimization approach to coarse-graining biochemical networks," *IET Syst. Biol.*, **3**(1), 24-39 (2009).

Yellamos, I., Bojarski, A., Joglekar, G., Venkatasubramanian, V., and Puigjaner, L., "Enhancing Abnormal Events Management by the Use of Quantitative Process Hazards Analysis Results," *Ind. Eng. Chem. Res.*, **48** (8), pp 3921-3933 (2009).

Blau, G., Lasinski, M., Orcun, S., Hsu S.-H., Caruthers, J. M., Delgass, W. N., and Venkatasubramanian, V., "High Fidelity Mathematical Model Building with Experimental Data: A Bayesian Approach," *Comp. Chem. Eng.*, **32**, 971-989 (2008).

Hsu S.-H., Krishnamurthy, B., Rao, P., Zhao, C., Jagannathan, S., and Venkatasubramanian, V., "A Domain-specific Compiler Theory Based Framework for Automated Reaction Network Generation," *Comp. Chem. Eng.*, **32**, 2455-2470 (2008).

Goyal, A., Patkar, P., G. Medvedev, Venkatasubramanian, V., Caruthers, J. M., Cao, J., and Midkiff, S. P., "Population balance kinetic model for interaction of 2-bisbenzothiazole-2'-disulfide (MBTS) with Sulfur," *Rubber Chemistry and Technology*, **81**(4), 671-708 (2008).

Patil, S., Srinivasa, S., Mukherjee, S., Ramana R. A. and Venkatasubramanian, V., "Breeding Diameter Optimal Topologies for Distributed Indexes," *Complex Systems*, (in press).

### Selected Conference Presentations

Plenary: "Resilient Control Systems Design: Issues, Challenges, and Opportunities," 1<sup>st</sup> International Symposium on Resilient Control Systems, ISRCS 2008, Idaho National Laboratory, Idaho Falls, September (2008).

Invited: "Cyberinfrastructure Enabled Molecular Products Design and Engineering: Opportunities and Challenges," Pan American Advanced Study Institute on Emerging Trends in Process Systems Engineering, Mar de Plata, Argentina, August (2008).





## Nien-Hwa Linda Wang

Ph. D., Minnesota, 1978

### Professor

### Research Areas

Chemical and Biochemical Separations, Ion Exchange, Adsorption, Simulated Moving Bed Chromatography, Complex Adaptive Systems

### Selected Professional Activities

Vice-Chair of Area 2e Adsorption and Ion Exchange, AIChE Member, AIChE Separations Division Networking Committee Co-chair of the Networking Session of the Separations Division, AIChE Annual Meeting, Philadelphia, PA, November (2008).

Chair of the Plenary Session I on Bioseparations: Celebrating One Hundred Years of Bioseparations, AIChE Annual Meeting, Philadelphia, PA, November (2008).

Co-Chair of the Symposium on SMB Technology, AIChE Annual Meeting, Philadelphia, PA, November (2008).

Organization Committee, the 5th Pacific in Conference on Adsorption Science and Technology, Singapore, May (2009).

### Selected Invited Lectures

"Simulated Moving Bed Technologies for Producing High Purity Biochemicals," Dept. of Chemical and Materials Engineering, Zhejiang University of Technology, Hangzhou, China, May (2009).

"Simulated Moving Bed Technologies for Producing High Purity Pharmaceuticals," School of Pharmacy and Life Sciences, Nanjing University of Technology, Nanjing, China, May (2009).

Invited Shou-Hun Distinguished Lecture, "Chiral Recognition Mechanisms in Polysaccharide-Based Sorbents," Chiral Technologies, West Chester, PA, November (2008).

### Selected Publications

Cremasco, M. A., Hritzko, B. J., and Wang, N.-H. L., "Experimental Purification of Paclitaxel from a Complex Mixture of Taxanes Using a Simulated moving Bed," *Brazilian Journal of Chemical Engineering*, **26** (1), 207-218 (2009).

Park, Y., Kim, S. H., Matalone, S., Wang, N.-H. L., and Franses, E. I., "Effect of Phosphate Salts Concentrations, Supporting Electrolytes, and Calcium Phosphate Salt Precipitation on the pH of Phosphate Buffer Solutions," *Fluid Phase Equilibria*, **278**, 76-84 (2009).

Kasat, R. B., Franses, E. I., and Wang, N.-H. L., "Experimental Probing and Modeling of Key Sorbent-Solute Interactions of Norephedrine Enantiomers with Polysaccharide-Based Chiral Stationary Phases," *J. of Chromatogr. A*, **1190**, 110-119 (2008).

Yu, C.-M., Mun, S., and Wang, N.-H. L., "Phenomena of Insulin Peak Fronting in Size Exclusion Chromatography and Strategies to Reduce Fronting," *J. of Chromatogr. A*, **1190**, 110-119 (2008).

Cauley, F., Cauley, S., and N.-H. L. Wang, "Standing Wave Optimization of SMB Using a Hybrid Simulated Annealing and Genetic Algorithm (SAGA)," *Adsorption J*, **14**, 665-678 (2008).

Lee, K. B., Kasat, R. B., Cox, G., and Wang, N.-H. L., "SMB Multiobjective Optimization Using Standing Wave Design and Genetic Algorithm," *AIChE J*, **54**(11), 2852-2871 (2008).

Kasat, R. B., Wee, S. Y., Loh, J. X., Wang, N.-H. L., and Franses, E. I., "Effect of the Solute Molecular Structure on its Enantioresolution on Cellulose Tris (3,5-dimethylphenylcarbamate)," *J of Chromatogr. B.*, **875**, 81-92 (2008).

Mun, S. Y. and Wang, N.-H. L., "Optimization of productivity in Solvent Gradient Simulated Moving Bed for Paclitaxel Purification," *Process Biochemistry*, **43** (12), 1407-1418 (2008).

### Selected Conference Presentations

Kasat, R. B., Franses, E. I., and Wang, N.-H. L., "Chiral Recognition Mechanisms in Polysaccharides-Based Adsorbents," The 5th Pacific Conference on Adsorption Science and Technology, Singapore, May (2009).

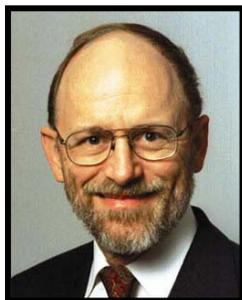
Invited Plenary Presentation, "Simulated Moving Bed Technologies for Producing Biochemicals," Workshop of the Center for Process Analytical Consortium, Rome, Italy, March (2009).

Invited Plenary Presentation, "Simulated Moving Bed Technologies for Producing Biofuels," Center for Process Analytical Consortium, Seattle, WA, July (2008).

Invited presentation: Kasat, R. B., Wang, N.-H. L., and Franses, E. I., "Elucidating Chiral Discrimination Mechanisms in Polysaccharide-Based Sorbents Using Experimental Probing and Molecular Modeling," Symposium Honoring Ted Davis I, AIChE Annual Meeting, Philadelphia, PA, November (2008).

Chung, P., Chin, C., Xie, Y., and Wang, N.-H. L., "Five-Zone Open Loop SMB for the Recovery of Fermentable Sugars from Corn Stover Hydrolysates," Networking Session of the Separations Division, AIChE Annual Meeting, Philadelphia, PA, November (2008).





**Phillip C. Wankat**  
Ph. D., Princeton University, 1970

**C. L. Lovell Distinguished Professor**  
**Director, Undergraduate Degree Programs,**  
**Department of Engineering Education**

**Research Areas**  
Adsorption Operations, Large-scale Chromatography, Distillation, Engineering Education

### Selected Professional Activities

Associate Editor of Chemical Engineering Education, 1995-present.  
Associate Editor, Annals of Research in Engineering Education, 2005-present.  
International Editorial Advisory Board of Journal of STEM Education, 2001 – present.  
Contributing Editor, College Teaching, 2006-present.  
Proceedings Editor for AIChE Topical Conference on Education, Nov. 2008.  
Member Organizing Committee for AIChE Education Division, 2008-present.  
NSF Chemical Separations Review panel, April 2009.

### Selected Invited Lectures

“Less is More: Developing More Flexible Curricula,”  
University of South Florida, Tampa, FL, May (2009).

### Selected Publications

Kostroski, K. and Wankat, P. C., "Separation of Concentrated Binary Gases by Hybrid Pressure-Swing Adsorption/Simulated-Moving Bed Processes," *Ind. Engr Chem. Research*, **48**, 4445-4465 (2009).

Wankat, P. C., "Note: Two Enthalpy Feed for Distillation with Vapor Feed and Refrigerated Condenser," *Separ. Science and Technology*, **44** (1), 102-109 (2009).

Sharma, P. K. and Wankat, P. C., "Hybrid Cycles to Purify Concentrated Feeds Containing a Strongly Adsorbed Impurity with a Nonlinear Isotherm: The PSA-TSA Supercycle," *Ind. Engr Chem. Research*, **48**, 6405-6416 (2009).

Lee, J.-W. and Wankat, P. C., "Comparison of Recycle Chromatography and Simulated Moving Bed For Pseudo-Binary Separations," *Ind. Engr Chem. Research*, **48**, 7724-7732 (2009).

Wankat, P. C., "The History of Chemical Engineering and Pedagogy: The Paradox of Tradition and Innovation," *Chem. Engr Educ.*, **43** (3), 216-224 (2009).

Kostroski, K. and Wankat, P. C., "Separation of Dilute Binary Gases by Simulated-Moving Bed with Pressure-Swing Assist," *Ind. Engr Chem. Research*, **47**, 3138-3149 (2008).

Lee, J. W. and Wankat, P. C., "Optimized Design of Recycle Chromatography for Separation of a Single Component from a Ternary Mixture," *Ind. Engr Chem. Research*, **47**, 9601-9610 (2008).

Wankat, P. C., "Pedagogical Training and Research in Engineering Education," *Chem. Engr Educ.*, **42** (4), 203-210 (2008).

Lee, J. W. and Wankat, P. C., "Optimized Design of Recycle Chromatography to Isolate Intermediate Retained Solutes in Ternary Mixtures: Langmuir Isotherm Systems," *J. Chromatography A*, (in press).

Wankat, P. C., "Separations: A Short History and a Cloudy Crystal Ball," *Chem. Engineering Education*, (in press).

### Selected Conference Presentations

Invited: "Time Management and Career Balance for Busy New Professors," New Faculty Forum, session 48, AIChE Annual Meeting, Philadelphia, PA, November (2008).

Invited: "The History of Chemical Engineering and Pedagogy: The Paradox of Tradition and Innovation," paper 191a, AIChE Annual Meeting, Philadelphia, PA, November (2008).

Invited: "Separations: A Short History and a Cloudy Crystal Ball," paper 674a, AIChE Annual Meeting, Philadelphia, PA, November (2008).





**You-Yeon Won**  
Ph. D., Minnesota, 2000

**Associate Professor**

**Research Areas**

Physics of polymers, polyelectrolytes, and block copolymers; polymer synthesis; polymer-based gene delivery; colloid self-assembly at liquid interfaces; scattering; microscopy; rheology

**Selected Professional Activities**

Chair for a session titled Structure and Properties of Polymers I at the 2009 AIChE Annual Meeting in Nashville, TN  
Chair for a session titled Structure and Properties of Polymers I at the 2008 AIChE Annual Meeting in Philadelphia, PA  
Chair for a session titled Polymerization Reaction Engineering, Kinetics, and Catalysis I at the 2008 AIChE Annual Meeting in Philadelphia, PA

**Selected Invited Lectures**

“Block Polymer-Based siRNA Delivery for RNAi Cancer Therapy,” Department Seminar, Department of Chemical and Biomolecular Engineering, Cornell University, Ithaca, NY, April (2009).

“Fabrication of Functional Nano/Microstructures at Various Water Interfaces via Colloid or Block Copolymer Self-Assembly,” 3M Tech Forum, 3M Company, St. Paul, MN, December (2008).

“Polymer Micelle-Based siRNA Delivery for RNAi Cancer Therapy,” Department Seminar, School of Chemical Engineering, Purdue University, West Lafayette, IN, November (2008).

**Selected Publications**

Hur, J., Witte, K. N., Won, Y.-Y., “On the Origins of the Salt-Concentration-Dependent Instability and Lateral Nanoscale Heterogeneities of Weak Polyelectrolyte Brushes: Gradient Brush Experiment, and Flory-Type Theoretical Analysis,” *Langmuir*, (in press).

Won, Y.-Y., Sharma, R., Konieczny, S. F., “Missing Pieces in Understanding the Intracellular Trafficking of Polycation/DNA Complexes,” *Journal of Controlled Release* **139**(2), 88-93 (2009).

Witte, K. N., Kim, S., Won, Y.-Y., “Self-Consistent Field Theory Study of the Effect of Grafting Density on the Height of a Weak Polyelectrolyte Brush,” *Journal of Physical Chemistry B* **113**(32), 11076-11084 (2009).

Witte, K. N., Hur, J., Sun, W., Kim, S., Won Y.-Y., “Evidence of Lateral Nanoscale Heterogeneities in Weak Polyelectrolyte Brushes,” *Macromolecules* **41**(23), 8960-8963 (2008).

Sharma, R., Lee, J.-S., Bettencourt, R. C., Xiao, C., Konieczny, S. F., Won, Y.-Y., “Effects of the Incorporation of a Hydrophobic Middle Block into a PEG-Polycation Diblock Copolymer on the Physicochemical and Cell Interaction Properties of the Polymer-DNA Complexes,” *Biomacromolecules* **9**(11), 3294-3307 (2008).

**Selected Conference Presentations**

Won, Y.-Y., Witte, K. N., Hur, J., “Origin of Lateral Nanoscale Heterogeneities in Weak Polyelectrolyte Brushes,” APS March Meeting, Pittsburgh, PA, March (2009).

Witte, K. N., Won, Y.-Y., “Self Consistent Field Theory Study of the Effect of Grafting Density on the Height of a Weak Polyelectrolyte Brush,” APS March Meeting, Pittsburgh, PA, March (2009).

Gary, D. J., Sharma, R., Won, Y.-Y., “ABC Triblock Copolymer Micelleplexes for Potent Gene Silencing and In Vivo Tumor Targeting,” AIChE Annual Meeting, Philadelphia, PA, November (2008).

Witte, K. N., Hur, J., Kim, S., Won, Y.-Y., “Evidence of Multimolecular Cooperative Charge Regulation In Weak Polyelectrolyte Brushes,” AIChE Annual Meeting, Philadelphia, PA, November (2008).

Hur, J., Sturtevant, B. D., Torabi, K., Corti, D. S., Won, Y.-Y., “Structure and Crystallization of Bidisperse Repulsive Colloids In Two Dimensional (2D) Space,” AIChE Annual Meeting, Philadelphia, PA, November (2008).

Gary, D. J., Won, Y.-Y., “ABC Triblock Copolymer Micelleplexes for Potent Gene Silencing and in Vivo Tumor Targeting,” Society for Biological Engineers’ Fourth International Conference on Bioengineering and Nanotechnology, Dublin, Ireland, July (2008).





**Yue Wu**  
Ph. D., Harvard, 2006

**Assistant Professor**

**Research Areas**

Synthesis, Characterization, Assembly of Nanostructured Materials and Their Potential Applications in Nanoscale Devices and Sustainable Energy

**Selected Publications**

Wadia, C., Wu, Y., Gul, S., Volkman, S. K., Guo, J., Alivisatos, A. P., "Surfactant-Assisted Hydrothermal Synthesis of Single phase Pyrite FeS<sub>2</sub> Nanocrystals," *Chemistry of Materials*, **21**(13), 2568 (2009).

Ma, W., Luther, J. M., Zheng, H. Wu, Yue; Alivisatos, A. P., "Photovoltaic Devices Employing Ternary PbS<sub>x</sub>Se<sub>1-x</sub> Nanocrystals," *Nano Letters*, **9** (4), 1699 (2009).

Wu, Y., Wadia, C., Ma, W., Sadtler, B., Alivisatos, A. P., "Synthesis of Copper (I) Sulfide Nanocrystals for Photovoltaic Application," *Nano Letters*, **8**(8), 2551 (2008).

**Selected Conference Presentations**

Poster: "Semiconductor Nanocrystal-based Solar Cells," 2008 Gordon Research Conference "Electron Donor and Acceptor," August (2008).

Poster: "Semiconductor Nanocrystal-based Solar Cells", 2008 Gordon Research Conference "Solid State Chemistry," July (2008).



**Chongli Yuan**  
Ph. D., Cornell, 2007

**Assistant Professor**

**Research Areas**

Biomimetic Nanoparticle Systems, Molecular Biophysics

**Selected Publications**

Yuan, C., Lou, X.W., Archer, L.A., "DNA bending stiffness on small length scales," *Phys. Rev. Lett.*, **100**, 018102 (2008).

Yuan, C., Lou, X.W., Rhoades, E., Chen, H., Archer, L.A., "T4 DNA ligase is more than an effective trap of cyclized product," *Nucleic Acids Res.*, **35**, 5294-5302 (2007).

Lou, X.W., Yuan, C., Archer, L.A., "Double-walled SnO<sub>2</sub> nano-cocoons with movable magnetic cores," *Advanced Materials*, **19**, 3328-3332 (2007).

# Graduate Degrees Awarded

(July 1, 2008 to June 30, 2009)

M. S.	12
Ph. D.	<u>24</u>
Total	36

## Ph. D. Degrees - August 2008

### 1. Cao, Lei

*Kinetic Modeling of NO<sub>x</sub> Storage-Reduction on Monolith*, (Caruthers/Delgass), Abbott, North Chicago, IL, Process Engineer

### 2. Hailemariam, Leaelaf M.

*The Purdue Ontology for Pharmaceutical Engineering*, (Venkatasubramanian), Dow Chemical, Midland, MI, Senior Researcher

### 3. Kasat, Rahul B.

*Elucidation of Chiral Recognition Mechanisms for Separations of Enantiomers using Polysaccharide-Based Sorbents*, (Franses/Wang), Wilmington, DE, DuPont, Research Engineer

### 4. Kim, Bum Soo

*Characterization and Analysis on Chemical and Mechanical Interactions during Chemical Mechanical Planarization (CMP) of Copper*, (Beaudoin), Intel, Hillsboro, OR, Process Engineer

### 5. Ratts, Joshua L.

*Reaction Steps for the Water-Gas Shift Reaction and NO<sub>x</sub>*, (Ribeiro), Caterpillar, Mossville, IL, Senior Research Engineer

### 6. Uline, Mark J.

*Toward a Molecular-Level Understanding of Bubble and Droplet Nucleation in Simple Fluids*, (Corti), Northwestern University, Evanston, IL, Postdoctoral Fellow

### 7. Zapata, J. Camilo

*New Product Portfolio Management under Uncertainty*, (Reklaitis), Lilly & Company, Indianapolis, IN, OR Statistician

### 8. Zhao, Yinyan

*Polysaccharide Gel Microspheres for Peptide and Protein Drug Delivery*, (Harris), Purdue University/IPPH, West Lafayette, IN, Postdoctoral Fellow

## M.S. Degrees - August 2008

### 1. Bhattacharya, Aparajita

Caruthers, MS Non-Thesis, Purdue University – WL, Continuing on for PhD

### 2. Krishnamurthy, Balachandra B.

Caruthers/Venkat, MS Non-Thesis, Purdue University – WL, Continuing on for PhD

### 3. Mayfield, Shatara C.

Liu, MS Non-Thesis (T), Altria Client Services, Senior Associate Engr. Richmond, VA

## Ph.D. Degrees – December 2008

### 1. Chung, Pei-Lun

*Design, Modeling, and Optimization of a Multicomponent Separation Process for Insulin Purification Using Reversed Phase Chromatography*, (Wang), ChE/Purdue University, West Lafayette, IN, Postdoctoral Research Associate

### 2. Gridhar, Arun

*Synthesis of Multicomponent Distillation Configuration*, (Agrawal/Venkatasubramanian), Purdue University/ChE, West Lafayette, IN, Postdoctoral Fellow

### 3. Hur, Jaehyun

*Self and Guided Assembly of Colloids at Air-Water and Substrate-Water Interfaces*, (Won), Yongin-si, Gyunggi-do, S. Korea, Samsung Advanced Inst of Techology, R & D Engineer

### 4. Jaiswal, Ravi

*Adhesion between Particles and Nanostructured Films*, (Beaudoin), Intel Company, Hillsboro, OR, Engineer

### 5. Jeong, Kyung Jae

*Mechanical Characterization of ECM-mimetic Hydrogel Based on Heparin-Peptide Interactions*, (Beaudoin/Panitch), Children's Hospital Boston, Boston, MA Postdoctoral Fellow

**6. Kostroski, Kyle**

*Development of New Pressure-Swing Adsorption Processes: Combination Cycles, CZPSA, and SMB/PSA Hybrids*, (Wankat), BP America, Naperville, IL, Research Engineer

**7. Kromer, Brian**

*Theoretical and Experimental Investigation of Heterogeneous Catalytic Reactions: Two Case Studies*, (Thomson), Praxair, Tonawanda, NY, Development Associate

**8. Krishnamurthy, Balachandra B.**

*Information Retrieval and Knowledge Management in Catalyst Chemistry Discovery Environments*, (Caruthers/Venkatasubramanian), Amazon.com, Seattle, WA, Software Development Engineer

**9. Sharma, Rahul**

*An ABC Triblock Copolymer Based Approach for Non-Viral Gene Delivery*, (Won), Dow Chemical Company, Freeport, TX, Senior Research Engineer

**10. Smith, Shanna J.**

*A Theoretical and Experimental Study on the Detection of Proteins in Solution with Electrochemical Impedance Spectroscopy* (Beaudoin), Indiana-Purdue University, Indianapolis, IN, Postdoctoral Fellow

**11. Suresh Babu, Pradeep**

*An Ontological Informatics Approach to Mechanistic Mathematical Model Management in Pharmaceutical Product Development*, (Reklaitis/Venkatasubramanian), Dow Chemical Company, Midland, MI, Research Scientist

**M.S. Degrees - December 2008**

**1. Bollmann, Luis**

(Hillhouse), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

**2. Diwan, Moiz**

(Varma), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

**3. Singh, Navneet R.**

(Agrawal/Ribeiro/Delgass), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

**4. Stamatis, Stephen D.**

(Caruthers/Delgass), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

**Ph.D. May 2009**

**1. Akkisetty, Venkata Sai Pavan**

*Ontological Informatics based Decision Support for Pharmaceutical Product Development: Milling as a Case Study*, (Venkat/Reklaitis), Intel Corporation, Hillsboro, OR, Process Development Senior Engineer

**2. Bollmann, Luis**

*Design of Improved Noble Metal Catalyst for the Water-Gas Shift Reaction*, (Ribeiro/Hillhouse), Dow Chemical Company, Freeport, TX, Sr. Research Engineer

**3. Lee, Kyung Min**

*The Effects of Relative Humidity on Lactose Particle Adhesion*, (Beaudoin), LG Chemical Inc., Daejeon, South Korea, Researcher

**4. Polster, Christopher S.**

*Design and Development of a Catalytic Microsystem for the Detection of CO in H2 Fuels* Baertsch, Eli Lilly & Company, Indianapolis, IN, Postdoctoral Researcher

**5. Tan, Chung Kwang Christopher**

*Catalytic Studies Utilizing Microfabricated Reactors: Applications to Improving Diesel Emissions Reduction Catalysts*, (Baertsch/Delgass), Intel Corporation, Hillsboro, OR, Process Engineer

**M.S. Degrees – May 2009**

**1. Cipich, Michelle N. Chaffee**

*Real Time Steady-State Data Reconciliation and Gross Error Detection in Continuous Pharmaceutical Manufacturing*, (Reklaitis/Venkat), Purdue University, West Lafayette, IN, Continuing on for PhD

**2. Chaugule, Saurabh S.**

(Delgass/Ribeiro), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

**3. Hall, Talesha**

(Harris), MS Non-Thesis, Jacobs Engineering, Golden, CO Process Safety Management Specialist

**4. Kar, Mahaprasad**

(Agrawal/Hillhouse), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

**5. Shah, Vishesh H.**

(Agrawal/Reklaitis), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

# Graduate Student Enrollment

Fall 2008

Last Name	First Name	Advisor(s)	UG Institution	Date Enrolled
Akkisetty	Pavan	Reklaitis/ Venkatasubramanian	Indian Institute of Tech, Madras	Fall 2004
Al-Kukhun	Ahmad	Varma	Jordan University of Science & Tech	Fall 2008
Al-Musleh	Easa	Agrawal/Reklaitis	Quatar University	Fall 2008
Appathurai	Santosh	Basaran/Harris	Indian Institute of Tech, Madras	Fall 2007
Balachandran	Dave	Beaudoin	University of Wisconsin	Fall 2006
Bates	Shane	Baertsch	Pennsylvania State University	Fall 2008
Bhattacharya	Aparajita	Caruthers	UICT - Mumbai	Fall 2004
Bollmann	Luis	Hillhouse	University of Notre Dame	Fall 2003
Boyle	Nanette	Morgan	Arizona State University	Fall 2004
Chaugule	Saurabh	Delgass/Ribeiro	UICT - Mumbai	Fall 2006
Chen	Shuang	Wang	Zhejiang University	Fall 2005
Chen	Ye	Reklaitis/Pekny	Zhejiang University	Fall 2007
Chung	Pei-Lun	Wang	National Taiwan University	Fall 2003
Cipich (Chaffee)	Michelle	Beaudoin	Tri-State University	Fall 2006
Diwan	Moiz	Varma	Indian Institute of Tech, Madras	Fall 2005
Dong	Jiannan	Franses/Corti	Zhejiang University	Fall 2008
Emady	Heather	Litster/Wassgren	University of Arizona, Tuscon	Fall 2007
Fingland	Bradley	Delgass/Ribeiro	University of Missouri	Fall 2004
Ford	Grayson	Agrawal/Hillhouse	University of California, Santa Barbara	Fall 2006
Gaik	Steven	Agrawal/Hillhouse	Pennsylvania State University	Fall 2007
Galas	Richard	Liu	SUNY - Buffalo	Fall 2008
Gao	Haijing	Basaran/Harris	Tsinghua University	Fall 2006
Gary	Dana	Won	Carnegie Mellon University	Fall 2005
Gatt	Joseph	Baertsch	University of Michigan	Fall 2004
Gawecki	Piotr	Agrawal/Delgass/ Ribeiro	University of California, Riverside	Fall 2008
Gridhar	Arun	Agrawal/Venkat	Indian Institute of Tech, Madras	Fall 2002
Guo	Qijie	Agrawal/Hillhouse	University of Rochester	Fall 2004
Hall	Talesha	Harris	North Carolina A & T University	Fall 2006
Hamdan	Intan	Reklaitis/ Venkatasubramanian	Purdue University	Fall 2006
Hamilton	Robert	Ramkrishna/Curtis	University of Missouri/ Purdue U.*	Fall 1999
Hodge	Bri-Mathias	Reklaitis/Pekny	Carnegie Mellon U./Abo Akademi*	Fall 2006
Hu	Wenbin	Varma	Tsinghua University	Fall 2006
Huang	Shisheng	Agrawal/Pekny/ Reklaitis	National University of Singapore	Fall 2007
Hur	Jaehyun	Won	Seoul National University	Fall 2003
Jaiswal	Ravi Prakash	Beaudoin	Indian Institute of Tech, Kanpur	Fall 2004
Jeong	Kyungjae	Beaudoin	Seoul National University	Fall 2002
Kadrmass	Clancy	Caruthers/Won	University of North Dakota	Fall 2007
Kadrmass	Julie	Liu	University of North Dakota	Fall 2007
Kar	Mahaprasad	Agrawal/Hillhouse	UICT-Mumbai	Fall 2005

<b>Last Name</b>	<b>First Name</b>	<b>Advisor(s)</b>	<b>UG Institution</b>	<b>Date Enrolled</b>
Kelchner	Megan	Beaudoin	University of Notre Dame	Fall 2003
Kilroy	Caitlin	Beaudoin	University of Notre Dame	Fall 2004
Kim	Dae Hwan	Won	Seoul National University	Fall 2007
Kim	Jaewoo	Caruthers	Seoul National University	Fall 2008
Kispersky	Vincent	Delgass/Ribeiro	University of California, Santa Barbara	Fall 2007
Kostroski	Kyle	Wankat	Purdue University	Fall 2004
Krishnamurthy	Bala	Venkatasubramanian	Indian Institute of Technology, Madras	Fall 2003
Kromer	Brian	Ribeiro/Thomson	University of Minnesota	Fall 2003
Lee	Eunwoong	Caruthers	Seoul National University	Fall 2006
Lee	Hoyoung	Won	Korea University	Spring 2009
Lee	Joonhyung	Won/Savran	Seoul National University	Fall 2004
Lee	Kyung Min	Beaudoin/Franses	Korea University/Purdue University	Fall 2003
Lee	Wen-Sheng	Delgass/Ribeiro	National Taiwan University	Fall 2007
Li	Jianfeng	Litster/Wassgren	Tsinghua University	Fall 2007
Lim	Jung Sun	Harris	Kyung Hee University	Fall 2005
Luque	Maria Elisa	Reklaitis/ Venkatasubramanian	University of Buenos Aires	Fall 2008
Mallapragada	Dharik	Agrawal/Delgass/ Ribeiro	Indian Institute of Technology, Madras	Fall 2008
Manz	Thomas	Caruthers/Thomson	University of Toledo/Purdue University*	Fall 2003
McCarthy	Robert	Agrawal/Hillhouse	Washington University	Fall 2007
Mc Gough	Patrick	Basaran	Purdue University/Purdue University	Spring 2007
Nair	Hari	Baertsch	UICT - Mumbai	Fall 2004
Novstrup	Krista	Caruthers/Delgass	University of Washington	Fall 2004
O'Grady	John	Morgan	Rose-Hulman Institute of Technology	Fall 2008
Ogebule	Oluwaseyi	Caruthers	Alabama Agricultural & ME U	Fall 2008
Oglesby	Patrick	Harris	Purdue University	Fall 2005
Park	Yoonjee	Franses	Seoul National University	Fall 2006
Pathare	Rugved	Agrawal/Venkat	UICT - Mumbai	Fall 2005
Pazmino	Jorge	Delgass/Ribeiro	U. San Fran De Quito, Ecuador	Fall 2006
Pham	Bich-Van	Beaudoin	Northwestern University	Fall 2004
Polster	Christopher	Baertsch	Purdue University	Fall 2004
Pommer	Chris	Basaran/Harris	Purdue University	Fall 2007
Prabhu	Rasika	Caruthers	University of Bombay	Fall 2007
Ramalingam	Santhosh	Basaran	Indian Institute of Technology, Madras	Fall 2005
Sambath	Krishnaraj	Basaran	Indian Institute of Technology, Madras	Fall 2008
Sengupta	Neelanjan	Morgan	Indian Institute of Technology, Bombay	Fall 2006
Shah	Vishesh	Agrawal/Reklaitis	UICT - Mumbai	Fall 2006
Sharma	Pradeep	Wankat	Indian Institute of Technology, Madras	Fall 2006
Sharma	Rahul	Won	Indian Institute of Technology, Kanpur	Fall 2003

Last Name	First Name	Advisor(s)	UG Institution	Date Enrolled
Shekhar	Mayank	Delgass/Caruthers/ Ribeiro/Thomson	UICT - Mumbai	Fall 2008
Shenvi	Anirudh	Agrawal/Reklaitis/ Venkatasubramanian	UICT - Mumbai	Fall 2007
Shu	Che-Chi	Ramkrishna	National Taiwan University	Fall 2007
Shukla	Aviral	Venkatasubramanian/Morris	Indian Institute of Technology, Madras	Fall 2006
Singh	Meenesh	Ramkrishna	Sardel Patel University	Spring 2008
Singh	Navneet	Agrawal/Delgass/ Ribeiro	UICT - Mumbai	Fall 2005
Smeltz	Andrew	Delgass/Ribeiro	Ohio University	Fall 2004
Smith	Kathryn	Beaudoin	University of Wisconsin	Fall 2008
Smith	Shanna	Beaudoin	University of Cincinnati	Fall 2003
Son	Sang Ha	Caruthers	Yonsei University	Fall 2007
Stamatis	Stephen	Caruthers/Delgass	University of Michigan	Fall 2005
Sturtevant	Bryce	Corti	North Carolina State University	Fall 2004
Sung	Pei-Fang	Harris	National Taiwan University	Fall 2006
Suresh Babu	Pradeep	Reklaitis/ Venkatasubramanian	Indian Institute of Technology, Madras	Fall 2004
Switzer	Jeffrey	Caruthers/Thomson	University of California, Davis	Fall 2006
Tan	Christopher	Baertsch	Purdue University	Fall 2004
Torabi	Korosh	Corti	Isfan University/IIT-Chicago	Fall 2007
Venkatesan	Anand	Wankat	Indian Institute of Technology, Madras	Fall 2008
Vora	Shaunak	Litster	UICT - Mumbai	Fall 2007
Werner	Sean	Morgan	University of Illinois	Fall 2005
Williams	W. Damion	Delgass/Ribeiro	University of Oklahoma	Fall 2006
Witte	Kevin	Won/Kim	Ohio State University	Fall 2004
Yohe	Sara	Agrawal/Delgass/ Ribeiro	University of Minnesota/Twin Cities	Fall 2008
Zarate	Nyah	Beaudoin/Litster	Illinois Institute of Technology, Chicago	Fall 2008
Zhang	Rong	Baertsch	Jilin University/Miami University	Fall 2007
Zhu	Qing	Harris/Taylor	Zhejiang University	Fall 2006

## Facilities



### Forney Hall of Chemical Engineering

In October 2004, the School of Chemical Engineering dedicated a 100,000 ft<sup>2</sup> expansion that more than doubled the size of our building. The building was then re-named the Forney Hall of Chemical Engineering. With new lecture facilities and new bioengineering, catalysis, and nanoscience research laboratories, the School has, for the first time in decades, space to grow. The old building is currently undergoing modernization, particularly in the laboratory and associated spaces. Renovation is scheduled to be completed in 2010.

### Discovery Park

Since 2002, Discovery Park - made up of 10 centers - has grown from an idea to a \$450 million interdisciplinary research, learning and engagement complex. More than 1,000 faculty have been involved in Discovery Park. Nearly 3,000 students have participated in Discovery Park programs, and 250 graduate students have offices there. Our faculty are involved in cutting edge research in the Bindley Bioscience, Birck Nanotechnology, Energy, and Oncological Sciences Centers.



### Bindley Bioscience Center

The Bindley Bioscience Center initiates and facilitates multi-investigator, multidisciplinary research that blends life sciences and engineering. State-of-the-art research programs focus along strategic lines that advance proteomic science and technology, bionanotechnology and biomicrotechnology, spectroscopy-microscopy for cellular and tissue imaging, tissue engineering, and bio-informatics.



### Birck Nanotechnology Center

The Birck Nanotechnology Center is a leading-edge national center for nanoscale research. The BNC leverages advances in nano-scale science and engineering to create innovative nanotechnologies that address challenges in computing, communications, the environment, security, energy independence and health. The Center is located in a \$54 million state-of-the-art building that houses specialized laboratories for nano-scale chemistry, physics, and biology; semiconductor-grade cleanrooms; and office space.

### Energy Center

The Energy Center is a multidisciplinary community of researchers, scientists, engineers, political scientists and economists. Their goal is create the energy solutions needed by Indiana, the Nation, and the World. Energy research areas include clean coal, solar, bio, wind, electrochemical, electric machines and power electronics, hydrogen and nuclear. Global partnerships and the social, economic and political aspects of energy use and policy are also being advanced. Research on the conversion of agricultural waste into transportation fuels is conducted in the Laboratory for Renewable Resource Engineering (LORRE) in the Energy Center.

### Oncology Center

The Oncological Sciences Center's mission is to eliminate cancer as a cause of suffering and death by applying and synergizing Purdue's strengths in the biological, chemical, engineering and human behavioral sciences. The Oncological Sciences Center builds and expands on the strong foundation of Purdue's NCI-designated Cancer Center. The Center has established strategic research partnerships with the Walther Cancer Institute and the Indiana University Simon Cancer in Indianapolis. The relationship with the Indiana University Simon Cancer Center provides the clinical setting necessary to advance and refine early-stage detection and treatment of cancers.

# Visitors

## Visiting Faculty

### **Dr. Jayant Modak**

Professor, Department of Chemical Engineering  
Indian Institute of Science, Bangalore

### **Dr. Luis Puigjaner**

UPC - ETSEIB  
Dpt. Enginyeria Química, Barcelona, Spain

## Academic Advisory Board

Formed in 2006 to provide input on academic issues, the Academic Advisory Board had its 2009 meeting on April 1-2. Current Board members, serving a 3-year term, are **Kristi Anseth**, Distinguished Professor, University of Colorado, Boulder; **Alex Bell**, Warren and Katharine Schlinger Distinguished Professor of Chemical Engineering, UC-Berkeley; **Ignacio Grossman**, Rudolph R. and Florence Dean University Professor of Chemical Engineering, Carnegie-Mellon University; **Michael Ramage**, Executive Vice President, ExxonMobil, (Retired); **Greg Stephanopoulos**, Bayer Professor of Chemical Engineering, MIT; and **Matt Tirrell**, Arnold and Barbara Silverman Professor in Departments of Bioengineering, Chemical Engineering and Materials Science & Engineering, University of California, Berkeley.

## Seminar Speakers - Spring 2009

### **January 13, 2009**

Dr. Richard McClurg  
Senior Research Investigator  
SSCI, an Aptuit Company

*"What is the role of chemical engineers in pharmaceutical development?"*

### **January 27, 2009**

Dr. William Schneider  
Associate Professor, Department of Chemical &  
Biomolecular Engineering  
University of Notre Dame

*"Environmental Catalysis from First Principles"*

### **January 29, 2009**

#### **GSO Seminar**

Dr. William Banholtzer  
Chief Technology Officer  
Dow Chemicals

*"How Chemical Engineers Will Save The World"*

### **February 10, 2009**

Dr. David Mooney  
Professor  
College of Engineering  
Harvard University

*"Materials to program cells in situ"*

### **February 17, 2009**

Dr. Jane P. Chang  
Professor  
Department of Chemical Engineering &  
Biomolecular Engineering  
University of California

*"Synthesis and Integration of Multifunctional Oxide Materials"*

### **February 24, 2009**

Dr. Robert J. Davis  
Professor and Chair  
Chemical Engineering Department  
School of Engineering & Applied Science  
University of Virginia

*"Catalytic Conversion of Biorenewable Molecules to Fuels and Chemicals"*

### **March 3, 2009**

Dr. Uma Chowdhry  
Senior Vice President & CSTO  
DuPont Experimental Station

*"A new era of innovation for sustainability"*

### **March 24, 2009**

Dr. Martin Feinberg  
Richard M. Morrow Professor of Chemical Engineering &  
Professor of Mathematics, College of Engineering  
College of Mathematical & Physical Sciences  
The Ohio State University

*"Stability and Instability in Chemical Reaction Networks:  
The Big Picture"*

### **March 31, 2009**

Dr. Douglas Clark  
Professor, Department of Chemical Engineering  
College of Chemistry  
University of California, Berkeley

**April 21-22, 2009 -Kelly Lecture Series**

Dr. Carol K. Hall

Camille Dreyfus Distinguished University Professor  
Department of Chemical & Biomolecular Engineering  
North Carolina State University

*“Thermodynamic and Kinetic Origins of Alzheimer’s and Related Diseases: a Chemical Engineer’s Perspective”*

*“Self-Assembly of Dipolar Particles: Designing Smart Materials Using Computer Simulation”*

**April 28, 2009**

Dr. Stratos Pistikopoulos

Professor, Department of Chemical Engineering  
Director, Center for Process Systems Engineering  
Imperial College of London

*“Multi-parametric Programming & Model Predictive Control—are they meant for each other?”*

**Fall 2008- Seminar Speakers**

**September 2, 2008**

Dr. Tillman Gerngross

Professor, Thayer School of Engineering  
Dartmouth

*“The Emergence of Humanized Yeast: A Novel Tool to Elucidate Glycosylation Dependent Structure Activity Relationships”*

**September 16, 2008**

Dr. Jayant Modak

Professor, Department of Chemical Engineering  
Indian Institute of Science, Bangalore

*“Multiobjective Optimization of Pichia Pastoris Fermentations”*

**September 23, 2008**

Dr. Alan Gent

Research Professor & Professor Emeritus  
Polymer Physics & Polymer Engineering  
University of Akron

*“Non-Linear Elasticity - 100 Years of the Poynting Effect”*

**September 30, 2008**

Dr. Jingguang Chen

Claire D. LeClaire Professor of Chemical  
Engineering

Department of Chemical Engineering  
University of Delaware

*“Rational Design of Bimetallic Catalysts for Hydrogenation and Reforming Reactions”*

**October 7, 2008**

Dr. Lynden Archer

Professor & Marjorie L. Hart Chair  
School of Chemical & Biomolecular Engineering  
Cornell University

*“Tethered Polymers”*

**October 21, 2008**

Dr. David Ford

Professor, Chemical Engineering Department  
University of Massachusetts

*“Cyber-Enabled Engineering of Colloidal Materials: Coupling Statistical Mechanics with Digital 3D Optical Microscopy”*

**October 28, 2008**

Dr. Frank Doyle

Duncan & Suzanne Mellichamp Chair in Process  
Control

Institute for Collaborative Biotechnologies  
Chemical Engineering

Biomolecular Science & Engineering  
University of California – Santa Barbara

*“The role of process systems engineering in the quest for the artificial pancreas”*

**November 11, 2008**

Dr. Monika Ivantysynova

MAHA Professor Fluid Power Systems  
School of Mechanical Engineering  
Department of Agricultural & Biological Engineering  
Purdue University

*“Advanced Surface Design Based on a Fully Coupled Fluid – Structure – Thermal and Multi-body Dynamics Simulation for a New Generation of Pumps and Motors”*

**November 25, 2008**

Dr. Jan Genzer

Department of Chemical & Biomolecular  
Engineering

North Carolina State University

*“On ‘Chemical Painting’ of Polymers: Formation of Heteropolymers with Adjustable Monomer Sequences (HAMS)”*

**December 2, 2008**

Dr. Johannes W. Schwank

Professor of Chemical Engineering  
Director, Transportation Energy Center

University of Michigan

*“On-Board Fuel Reforming for SOFC-based Auxiliary Power Units”*