



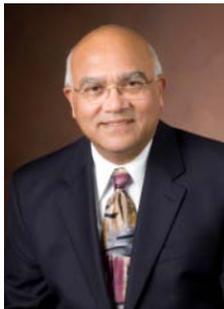
School of Chemical Engineering



Professional Activity Report 2009-10

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Purdue University School of Chemical Engineering

Message from the Head

As I was preparing to write this message, the Wall Street Journal (September 13, 2010) published the corporate recruiters' survey and I was delighted to see that Purdue University ranked fourth in the nation in preparing its students for the work force, with Purdue Engineering ranking second in the US! The newspaper surveyed 842 top recruiting executives to find the schools that best prepare students to land satisfying, well-paying jobs that also have growth potential. Responses from 479 recruiters were received. As a group, the survey participants hired more than 43,000 new graduates in the past year. I am pleased to see that our efforts are noticed and recognized but, more importantly, I am delighted that our students are successful!

2008-09 was a record year for the number of BS and PhD degrees our School awarded, ranking second in BS production with 106 degrees and fourth in PhD production with 24 degrees (Chemical & Engineering News, August 23, 2010). In 2009-10, we awarded 143 BS and 18 PhDs, thus we expect to maintain our place at the top. Educating an increasing number of students comes with its challenges. We doubled our available space in 2005 with the Forney Hall addition; since then we have been continuously renovating the original part of the building, in phases, to bring it to the same high standards of functionality. I am pleased to inform that in 2009-10 we completed the renovation of the 1st floor and one-half of the ground floor. We are tirelessly working to complete renovation of the entire building, expected about one year from now, and we thank all our alumni, friends and corporate partners for their generous support.

In December 2009 we finalized the 2010-14 School Strategic Plan. A committee comprised of alumni, faculty, staff and students identified seven areas on which our School will focus for the next five years to reach our mission of being widely recognized among the premier ranks of chemical engineering programs in the world. For a summary of our plan, please read the following page, while the full version is available at <https://engineering.purdue.edu/ChE>.

In April of this year, we sailed into uncharted territories, or should I say drove in electrical carts, as we organized the first-ever electrical Grand Prix! This was a large interdisciplinary effort and the first electric vehicle Grand Prix-style go-kart race for college students in the nation. Fifteen go-karts participated, supported by student teams from computer information technology, electrical and computer technology, women in technology, mechanical engineering technology, industrial engineering and of course our School. In a DOE grant led by our Prof. Jim Caruthers, Purdue is working with the University of Notre Dame, Indiana University-Purdue University Indianapolis, Ivy Tech Community College, Purdue University Calumet and Indiana University Northwest to develop the degree and training programs to support the emerging electric vehicle industry. The educational institutions in the I-AEVtec consortium will create about 28 courses over the next three years for programs including an associate degree and electric vehicle technology certificates as part of bachelor's, master's and doctoral degrees in various engineering and technology disciplines. The evGrandPrix was developed to provide hands-on experience in electro-mechanical technology, complementing the formal coursework.

In May 2010, we celebrated two of our distinguished alumni, Deborah Grubbe (BSCHE '77) and Timothy McGinley (BSCHE '63), who received Honorary Doctorate degrees from Purdue University. It is with great pleasure that I see the full circle completing; every new student who joins our School receives the education and tools to go out in the world and make his/her mark; and we are proud to welcome back and recognize the most illustrious among them with an HDR degree.

As you read our annual report of activities, I know you will appreciate the countless hours and dedicated efforts that go behind graduating every student, writing every paper, and preparing each presentation. We thank our generous alumni, friends, corporate partners and funding agencies for their support that makes all this possible.

Sincerely,

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



School of Chemical Engineering *Strategic Plan 2010-2014*

Vision:

Be widely recognized among the premier ranks of chemical engineering programs in the world.

Mission:

Provide students with a rigorous and relevant education, conduct field-defining research, and enhance the School's global impact.

Values:

Leadership;
excellence and innovation;
relevance and impact;
commitment and responsibility;
teamwork and partnership;
diversity and respect;
safety and sustainability.

Research: To pursue breakthrough research that extends the boundaries of chemical engineering into areas which promote sustainability and which will have the greatest positive impact on our global society.

Education:

Graduate Programs - Recruit and retain high caliber graduate students from top-tier chemical engineering programs, provide challenging and relevant research programs, and a quality graduate level education.

Undergraduate Programs - Recruit and retain the most capable, motivated and diverse class of undergraduates, and help them to obtain a solid and relevant education throughout their Purdue experience.

Global Impact: Educate undergraduate and graduate students who will be successful in a global environment. Cultivate and expand research relationships with prominent international research organizations.

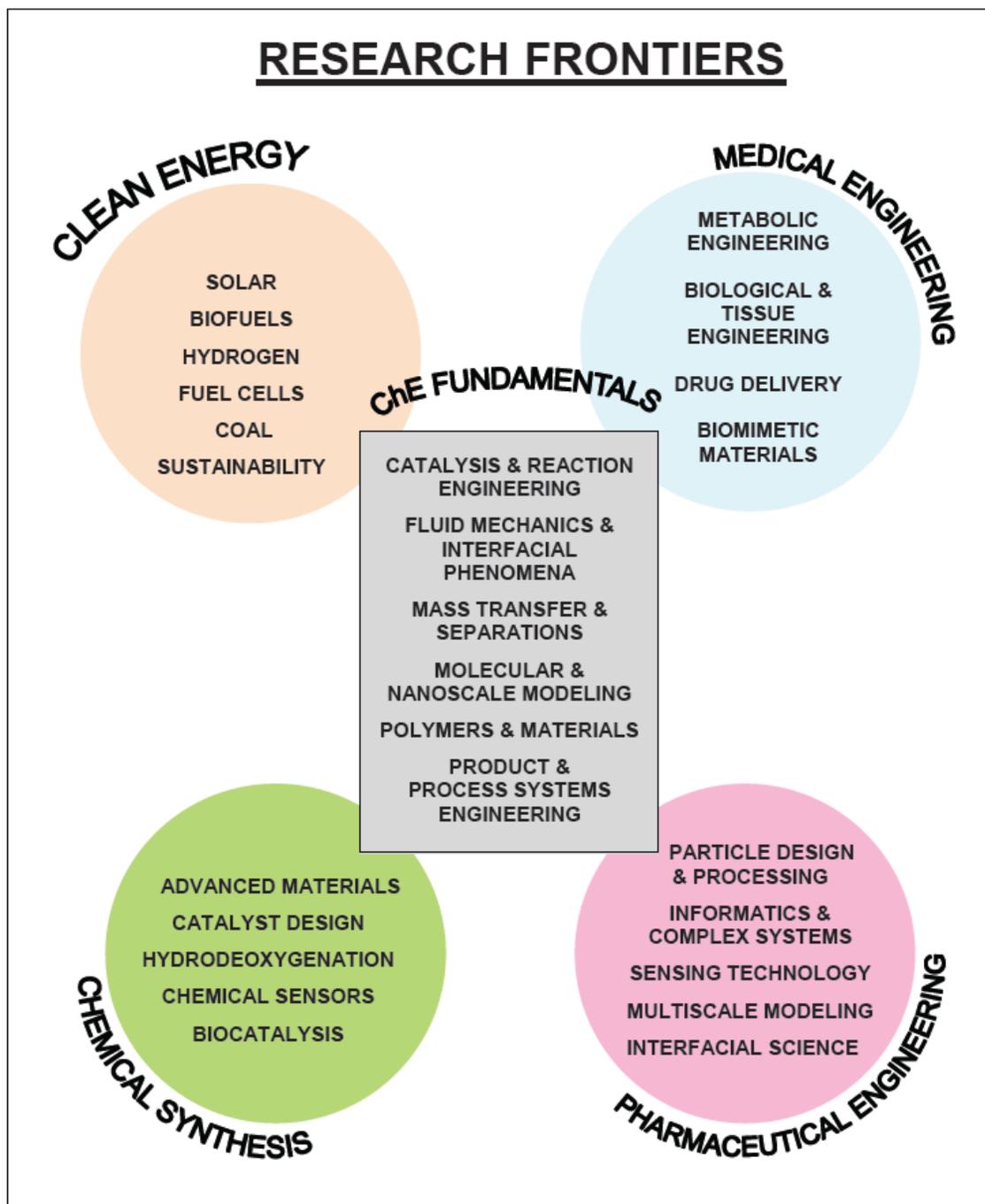
Development: Secure and improve the School's financial foundation as a means to continually improve its programs and physical facilities, while balancing short and long term goals.

Engagement: Encourage faculty, staff and students to develop a sense of personal responsibility and accountability for service at both the local and national levels. Promote entrepreneurial activity, leading to intellectual property, including invention disclosures and patents. Become a leader in sustainability on the Purdue campus.

Professional Development and Recognition: Encourage all faculty, staff and students to participate in activities that will enhance their career, develop their skills, and help them become more creative and productive. Actively promote recognition by internal and external award nominations.

Culture and Environment: Create an environment where faculty, staff and students are treated with respect and where superior teamwork is achieved. Enhance and expand safety activities and safety education.

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, Litster, Pipes, Varma, Won, Wu

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

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

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

Medical Engineering - Caruthers, Chakrabarti, Franses, Liu, Pekny, 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

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

Member, Editorial Advisory Board, I&EC Research
Member, Chem. Eng. Department Advisory Committee, WPI
Member, Technical Advisory Boards of Dow Chemicals, Genometica, Kyrogen Ltd., Weyerhaeuser
Member, NRC Board on Energy and Environmental Systems (BEES)
Member, NRC Committee on Plug-in Hybrid Electric Vehicles

Selected Invited Lectures

“Solar Based Sustainable Energy Solutions”, Plenary Lecture, 2nd International Symposium on Sustainable Chemical Product and Process Design (ISSCPPE), Hangzhou, China, May (2010).

“Solar Based Sustainable Energy Solutions”, Maddox Solar Energy Series, Whitacre College of Engineering, Texas Tech University, Lubbock, TX, February (2010).

“Transportation Fuel Solutions Using Renewable Energy”, RTI Fellows Symposium, RTI International, NC, November (2009).

“Energy Solutions for a Fossil Fuel Deprived Future”, Pioneers in Energy Lecture, Purdue University, West Lafayette, IN, September (2009).

“Thin Film Solar Cells from Nanocrystal Inks of Quaternary Semiconductors”, GE Global Research, NY, September (2009).

“Energy Saving Opportunities in Distillation: Identification of Useful Configurations”, Keynote Lecture, 10th International Symposium on Process Systems Engineering, PSE 2009, Brazil, August (2009).

“Synergistic Processes for Biofuels”, Plenary Lunch Lecture, BioFuels Conference- The Next Generation of Biofuels, Mississippi State University, Jackson, MS, August (2009).

Selected Publications

Giridhar, A. and Agrawal R. “Synthesis of Distillation Configurations: I. Characteristics of a Good Search Space,” *Computers & Chem. Eng.*, **34**, 73 (2010).

Giridhar, A. and Agrawal, R., “Synthesis of Distillation Configurations: II. A Search Formulation for Basic Configurations,” *Computers & Chem. Eng.*, **34**, 84 (2010).

Shah, V.H. and Agrawal, R., “A Matrix Method for Multicomponent Distillation Sequences,” *AIChE Journal*, **56** (7), 1759 (2010).

Agrawal, R. and Singh, N.R., “Solar Energy to Biofuels,” *Annual Review of Chemical and Biomolecular Engineering*, **1**, 343 (2010).

Singh, N.R., Delgass, W.N., Ribeiro, F.H., and Agrawal, R., “Estimation of Liquid Fuel Yields from Biomass,” *Environmental Science and Technology*, **44**, 5298 (2010).

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

Guo, Q. J., Ford, G. M., Hillhouse, H. W., and Agrawal, R., “Sulfide Nanocrystal Inks for Dense Cu(In_{1-x}Ga_x)(S_{1-y}Se_y)₂ Absorber Films and Their Photovoltaic Performance,” *Nano Letters*, **9** (8), 3060 (2009).

Guo, Q. J., Hillhouse, H. W. and Agrawal, R. “Synthesis of Cu₂ZnSnS₄ Nanocrystal Ink and Its Use for Solar Cells,” *J. Am. Chem. Soc.*, **191**, 11672 (2009).

Agrawal, R, Mallapragada, D.S. “Chemical Engineering in a Solar Energy Driven Sustainable Future,” *Accepted for publication in AIChE Journal* (An invited perspective article).

Pathare, R. and Agrawal, R. “Design of Membrane Cascades for Gas Separation,” *Available on line in Journal of Membrane Science*, <http://dx.doi.org/10.1016/j.memsci.2010.08.029>.

Selected Conference Presentations

“Thin Film Solar Cells from Nanocrystal Inks of Quaternary Semiconductors,” Solar Workshop at CNM Users Meeting, Argonne National Laboratory, Chicago, IL, October, (2009).

“More Liquid Fuel from Biomass,” Indo-US Workshop on Climate and Energy Futures, Chennai, India, October (2009).

Intellectual Property

“Novel Process for Producing Liquid Hydrocarbon by Pyrolysis of Biomass in Presence of Hydrogen from a Carbon-free Energy Source,” R. Agrawal, M. Agrawal and N. R. Singh, Pending US patent Application, WO/2009/029660

“Process for distillation of Multicomponent Mixtures into Five Product Streams,” R. Agrawal, V. H. Shah and A.V. Giridhar, Pending US Patent Application US-2010-0025221-A1 (2010).

“Selenization of Precursor layer containing CuInS₂ Nanoparticles,” R. Agrawal, Q. J. Guo and H.W. Hillhouse, International Patent Application No. PCT/US2010/21636 (2010).

“I-III-VI₂ Absorber Films Using Nanoparticle Inks,” R. Agrawal, H.W. Hillhouse, Q. J. Guo and M. Kar, Int. Pat. App. No. PCT/US2010/036259.

“Synthesis of Multinary Chalcogenide Nanoparticles Comprising of Cu, Zn, Sn, S, and Se,” R. Agrawal, H.W. Hillhouse and Q. J. Guo, Int. Pat. App. No. PCT/US2010/036261.



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; DOE, Office of Basic Energy Science
- North American Catalysis Society – program abstract submissions

AIChE Annual Meeting (2009)

- Sensor Topical Conference Chair
- Session Chair: In-situ and Operando Characterization of Catalysts; Session Chair: Fundamentals of Oxide Catalysts

Organizing committee, 4th International Congress on Operando Spectroscopy:

- Guest editor for a special issue of Catalysis Today publishing a selection of papers from the conference
- Coordinator for obtaining and distributing student travel fund grants from DOE and NSF.

Selected Invited Lectures

American Chemical Society Annual Spring Meeting, Ipatieff Prize: Invited Symposium in Honor of Christopher W. Jones, “Designing catalysts that add intrinsic chemical specificity to micro gas sensors: Applications in CO and ethanol detection in fuels,” San Francisco, CA, March (2010).

Selected Publications

Nair, H., Miller, J.T., Stach, E.A., and Baertsch, C.D., “Mechanism of dynamic structural reorganization in polyoxometalate catalysts,” *Journal of Catalysis* **270**, 1, 40–47 (2010).

Polster, C.S., Zhang, R., Cyb, M.T., Miller, J.T. and Baertsch, C.D., “Selectivity loss of Pt/CeO₂ PROX catalysts at low CO concentrations: mechanism and active site study,” *Journal of Catalysis*, **273**, 50–58 (2010).

Gatt, J.E., Nair, H. and Baertsch, C.D., “Application of VO_x-Al₂O₃ and Fe₂(MoO₄)₃-MoO₃ catalysts for the selective reaction and detection of ethanol in multi-component fuel mixtures,” *Applied Catalysis B: Environmental* **99**, 127–134, (2010).

Selected Conference Presentations

Zhang, R., Polster, C.S., Nair, H., Haddadin, T. and Baertsch, C.D., “Reactive titration method to quantify reactive CO and H₂ adsorbed on CuO_x-CeO₂ surface during CO preferential oxidation,” Chicago Catalysis Club Spring Symposium, May (2010).

Thompson, J.M., Bordley, J.A., Gatt, J.E., Baertsch, C.D., and Choung, S.Y., “Poster: Effect of methanol and nitrogen containing compounds on the activity, selectivity, and stability of Fe₂(MoO₄)₃ catalysts in the partial oxidation of ethanol,” American Chemical Society Annual Spring Meeting, San Francisco, CA, March (2010).

Bordley, J.A., Thompson, J.M., Gatt, J.E., Baertsch, C.D., and Choung, S.Y., “Poster: Studies of the partial oxidation of ethanol and methanol over an iron molybdate catalyst and the effect of sulfur compounds,” American Chemical Society Annual Spring Meeting, San Francisco, CA, March (2010).

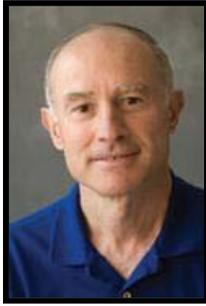
Tan, C.K.C., Delgass, W.N., and Baertsch, C.D., “Spatially resolved *in situ* FTIR analysis of CO adsorption and reaction on Pt/SiO₂ in a silicon microreactor,” Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN, November (2009).

Nair, H., Stach, E.A., Baertsch, C.D. “Mechanism of Dynamic Structural Reorganization in Polyoxometalate Catalysts,” 21st North American Catalysis Society Meeting, San Francisco, CA, June (2009).

Nair, H., Baertsch, C.D., “Poster: Mechanism and Active Site Density Elucidation for Ethanol Oxidation Over Supported VO_x, MoO_x, and WO_x Catalysts,” 21st North American Catalysis Society Meeting, San Francisco, CA, June (2009).



ChE Graduate Students at a sporting event



Osman Basaran

Ph. D., University of Minnesota, 1984

Burton and Kathryn Gedge Professor

Research Areas

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

Selected Professional Activities

Session Chair, "Drops IV: Breakup (Session GH)," 62nd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Minneapolis, MN, November 22-24, 2009.

Selected Invited Lectures

"EHD jetting and emission of charged drops from Taylor cones," Chemical Engineering Department and the Levich Institute, City College of CUNY, New York, NY, May (2010).

Selected Publications

Bhat, P. P., Appathurai, S., Harris, M. T., Pasquali, M., McKinley, G. H., and Basaran, O. A., "Formation of beads-on-a-string structures during breakup of viscoelastic filaments," *Nature Phys.* **6**, 625-631 (2010).

Selected Conference Presentations

Keynote/Plenary: Basaran, O. A., "Using simulation and experiment to uncover the influence of material properties in ink jet printing," Nanotech 2010, Anaheim, CA, June (2010).

Keynote/Plenary: Basaran, O. A., "Computational analysis of complex free surface flows with multi-physics: EHD jetting/tip-streaming and viscoelastic jet/drop breakup," Tenth US National Congress on Computational Mechanics, Columbus, OH, July (2009).

Keynote/Plenary: Basaran, O. A., "Interplay between simulation, theory, and experiment in nonstandard inkjet printing: from new devices to complex fluids," AVS 56th International Symposium and Exhibition, San Jose, CA, November (2009).

McGough, P. T., Sambath, K., Appathurai, S., Bhat, P. B., Harris, M. T., and Basaran, O. A., "Contraction of asymmetric Newtonian liquid filaments," 62nd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Minneapolis, MN, November (2009).

Sambath, K., McGough, P. T., Appathurai, S., Bhat, P. B., Harris, M. T., and Basaran, O. A., "Effect of initial shape on contraction dynamics of Newtonian filaments," 62nd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Minneapolis, MN, November (2009).

Pommer, C., Suryo, R., Subramani, H., Harris, M. T., and Basaran, O. A., "Scaling in two-fluid pinch-off," 62nd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Minneapolis, MN, November (2009).

Gao, H., Xu, Q., Harris, M. T., and Basaran, O. A., "Production of ultra-small ink jet drops using drop-on-demand (DOD) drop formation," 62nd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Minneapolis, MN, November (2009).

Ramalingam, S. and Basaran, O. A., "Oscillations of a capillary switch used as a miniature opto-fluidic device," 62nd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Minneapolis, MN, November (2009).

Harris, M. T., Appathurai, S., Bhat, P. B., and Basaran, O. A., "Dynamics of contracting viscoelastic filaments," 62nd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Minneapolis, MN, November (2009).

Bhat, P. B., Appathurai, S., Harris, M. T., Pasquali, M., McKinley, G. H., and Basaran, O. A., "Formation of beads-on-a-string structures during the pinch-off of viscoelastic filaments," 62nd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Minneapolis, MN, November (2009).

Appathurai, S., Bhat, P. B., Harris, M. T., Pasquali, M., and Basaran, O. A., "On the evolution of the drop-filament corner region during the pinch-off of viscoelastic fluids," 62nd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Minneapolis, MN, November (2009).

Ramkrishna, D., Ramalingam, S., and Basaran, O. A., "Small-amplitude oscillations of a drop pinned at an azimuth," 62nd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Minneapolis, MN, November (2009).

Shen, Y., Elele, E., Palle, P., Khusid, B., Basaran, O. A., McGough, P. T., and Collins, R. T., "Electro-hydrodynamic printing of drugs onto edible substrates," 62nd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Minneapolis, MN, November (2009).

Keynote/Plenary: Basaran, O. A., "Universal scaling laws for the sizes and charges of drops emitted from electrified liquid cones," *Electrification of Water Drops and Ice Particles: Through Simulations, in the Laboratory and in the Natural Environment*, A Telluride Science Research Center Workshop, Telluride, CO, August (2009).



Forney Hall in the winter



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, Biosensors

Selected Professional Activities

President, Particle Division, Adhesion Society, 2008-present

Selected Invited Lectures

Jaiswal, R., Kilroy, C., Pham, B., Lee, K.-M., Balachandran, D., and Beaudoin, S., "Micro- and Nano-Scale Phenomena in the Adhesion of Particles to Surfaces", Annual General Meeting of the International Fine Particle Research Institute (IFPRI), Ann Arbor, MI, June (2009).

Selected Publications

Jaiswal, R., Kumar, G., Kilroy, C., 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*, **25** (18), 10612–10623 (2009).

Jaiswal, R., and Beaudoin, S., "Nanoparticle Adhesion Models: Applications in Particulate Contaminant Removal from Extreme Ultraviolet Lithography Photomasks," *Journal of Adhesion Science and Technology* (in press).

Farrell, M., and Beaudoin, S., "Surface Forces and Protein Adsorption on Dextran- and Polyethylene Glycol-Modified Polydimethylsiloxane," *Colloids and Surfaces B: Biointerfaces* (in press).

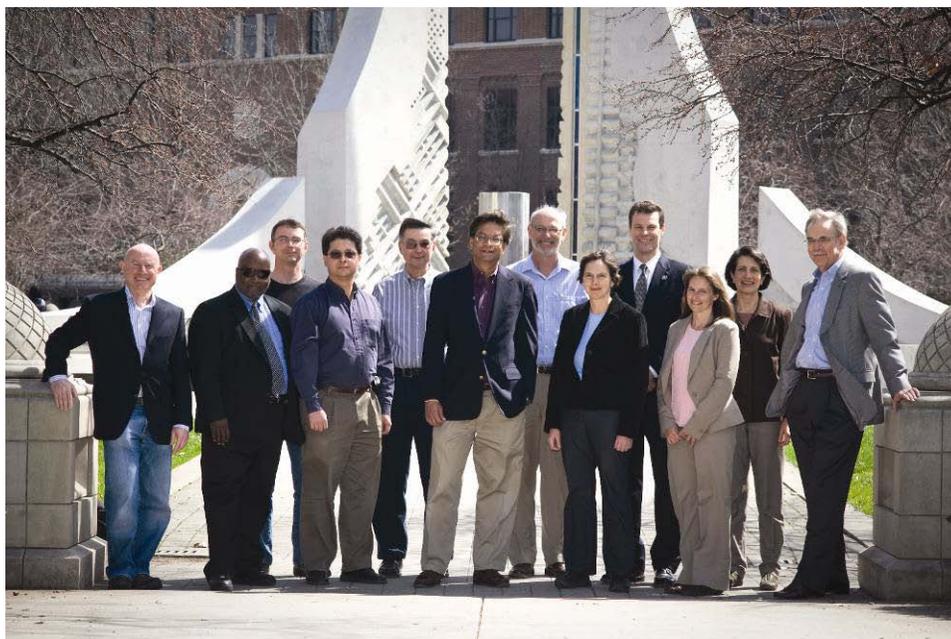
Selected Conference Presentations

Kelchner, M., and Beaudoin, S., "Comparison of Polysaccharide Coatings to Limit Protein Adsorption on Polydimethylsiloxane," Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN, November (2009).

Pham, B.-V. and Beaudoin, S., "Characterization of Interaction Force Between Bovine Serum Albumin and Self-Assembled Monolayers Relating to Protein Adhesion," Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN, November (2009).

Kilroy, C., and Beaudoin, S., "Particle Adhesion in Microelectronics Processing," Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN, November (2009).

Balachandran, D., Jallo, L. J., Davé, R. N., and Beaudoin, S. P., "Effect of Substrate Roughness On Nano-Silica Coated Micron-Scale Particle Adhesion," Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN, (2009).



Professor Beaudoin (4th from right) with the Pharma ERC group winner of the COE Faculty Team Excellence award



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

Novstrup, K.A., Travia, N., Medvedev, G.A., Stanciu, C., Switzer, J., Thomson, K.T., Delgass, W.N., Abu-Omar, M.M. and Caruthers, J.M., "Mechanistic Detail Revealed via Comprehensive Kinetic Modeling of [rac-(C₂H₄(1-Indenyl)₂Zr(Me)₂]-Catalyzed 1-Hexene Polymerization," *Journal of American Chemical Society*, **132** (2), 558-566 (2010).

Cao, J., Goyal, A., Novstrup, K.A., Midkiff, S.P. and Caruthers, J.M., "A Parallel Levenberg-Marquardt Algorithm," *IEEE Transactions on Parallel and Distributed Computing*, of the 23rd International Conference on Supercomputing (ICS '09), 450-459 (2009).

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*, **47**, 1713-1727, (2009).

Lee, E.W., Medvedev, G.A. and Caruthers, J.M., "Deformation Induced Evolution of Mobility in PMMA," *J. Polymer Sci.: Polymer Physics* (in press).

Maddipati, S.V., Delgass, W.N. and Caruthers, J.M., "Determination of the Catalytic Sites for Ziegler Natta Homopolymerization from GPC Data," *Macromolecular Theory and Simulation* (in press).

Selected Conference Presentations

Kim, J.W., Medvedev, G. A., and Caruthers, J. M., "Yield in Thermoset Polymers Probed by Longitudinal Deformation Experiment," Society of Experimental Mechanics, Annual Conference, Indianapolis, IN, June (2010).

Invited: Caruthers, J.M., "Purdue Parallel Modeling Environment (PPME): Cyber-Infrastructure for Kinetic Model Development," Catalytic Material by Design, Notre Dame, IN, January, (2010).

Caruthers, J. M. and Medvedev, G. A., "Nonlinear Viscoelastic Behavior of Glassy Polymers and Its Effect on the Onset of Irreversible Deformation of the Matrix Resin in Continuous Fiber Composites," 17th International Conference on Composite Materials, Edinburg, Scotland, August (2009).



Professor Caruthers (3rd from right) at the 2010 Inaugural Electrical Grand Prix



Raj Chakrabarti
PhD, Princeton University, 2002

Assistant Professor

Research Areas

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

Selected Professional Activities

Reviewer:

- Peer-reviewer of journal publications: Journal of Statistical Physics, Europhysics Letters (2010)
- NSF CBET Biocatalysis Review Panel, January, 2010

Selected Invited Lectures

“Molecular control engineering,” Dept. of Chemistry, Purdue University, West Lafayette, IN, April (2010).

“Control and optimization of molecular systems,” Dept. of Physics, Purdue University, West Lafayette, IN, February (2010).

“Quantum control landscapes and the design of adaptive feedback control algorithms,” Wolfgang Pauli Mathematical Institute, University of Vienna, (2009).

“Sequence optimization and evolutionary dynamics of enzyme active sites,” Dept. of Biophysics, Yale University, (2009).

Selected Publications

Brif, C., Chakrabarti, R., and Rabitz, H., “Control of quantum phenomena: past, present and future,” *New J. Phys.* **12**, 075008 (2010).

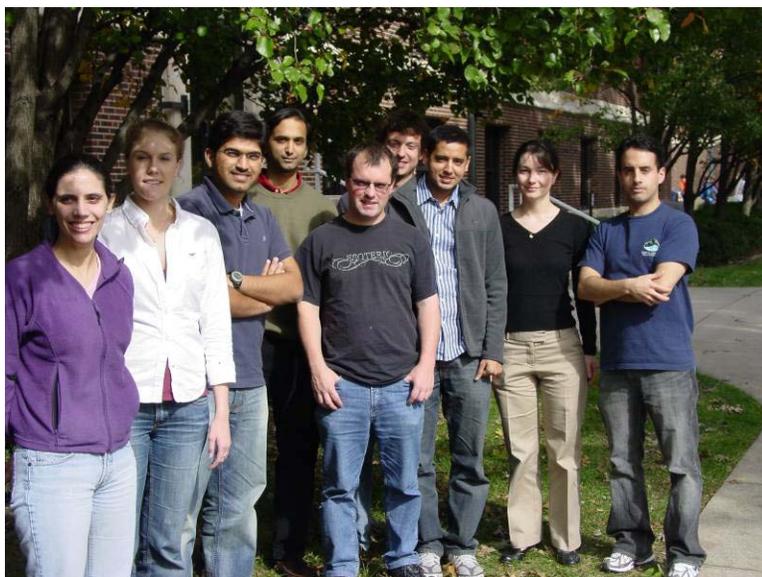
Wu, R., Chakrabarti, R., and Rabitz, R., “Critical landscape topology for optimization on the symplectic group,” *J. Opt. Theory Appl.* **145**, 387 (2010).

Chakrabarti, R. and Ghosh, A., “Asymptotic efficiency and finite sample performance of frequentist quantum state estimation,” arxiv **0904**: 1628 [quant-ph] (2009).

Pechen, A., Brif, C., Wu, R., Chakrabarti, R., and Rabitz, H., “General unifying features of controlled quantum phenomena,” *Phys. Rev. A*, **82**, 030101-(1-4) (2010).

Brif, C., Chakrabarti, R., and Rabitz, H., “Control of quantum phenomena,” *Adv. Chem. Phys.* (in press).

Moore, K., Chakrabarti, R., Riviello, G., and Rabitz, H., “Search complexity and resource scaling for the optimal control of quantum unitary transformations,” *Phys. Rev. A*; arxiv **1006.1829** [quant-ph] (submitted).



Professor Chakrabarti (4th from left) with the Chemical Engineering Sustainability Initiative Group



David S. Corti

Ph. D., Princeton University, 1997

Professor

Director of Undergraduate Studies, Chemical Engineering

Research Areas

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

Selected Professional Activities

Member of the Area 1a Programming Committee, AIChE (September 2007 to August 2010)

Area 1a Program Organizer for Fall 2009 AIChE National Meeting, Nashville, TN

Session chair, "Poster Session: Thermodynamics and Transport Properties," AIChE National Meeting, Nashville, TN, November (2009)

Selected Invited Lectures

Corti, D. S., "On the Mesoscopic Modeling of Entropically Controlled Colloidal Dispersions," Department of Chemical Engineering, University of Massachusetts, Amherst, MA, October (2009).

Selected Publications

Zhao, Y., Ng, H. T., Hanson, E., Dong, J., Corti, D. S. and Franses, E. I. "Computation of Non-Retarded London Dispersion Coefficients and Hamaker Constants of Copper Phthalocyanine," *J. Chem. Theory Comput.* **6**, 491-498 (2010).

Dong, J., Corti, D. S., Franses, E. I., Zhao, Y., H. T. N and Hanson, E., "Colloidal Dispersion Stability of CuPc Aqueous Dispersions and Comparisons to Predictions of the DLVO Theory for Spheres and Parallel Face-to-Face Cubes," *Langmuir* **26**, 6995-7006 (2010).

Park, Y., Huang, R., Corti, D. S. and Franses, E. I., "Colloidal Dispersion Stability of DPPC Vesicles in Aqueous Electrolyte Solutions and Comparisons to Predictions of the DLVO Theory," *J. Coll. Int. Sci.* **342**, 300-310 (2010).

Siderius, D. W. and Corti, D. S. "On the Line Tension of Curved Boundary Layers. I. Boundary Thermodynamics," *Ted Davis Festschrift, J. Phys. Chem. B* **113**, 13849-13859 (invited paper) (2009).

Torabi, K. and Corti, D. S., "Molecular Simulation Study of Cavity-Generated Instabilities in the Superheated Lennard-Jones Liquid," *J. Chem. Phys.* (in press).

Selected Conference Presentations

K. Torabi* and D. S. Corti, "Molecular Simulation Study of Instabilities in Superheated Liquids," 2010 Midwest Thermodynamics and Statistical Mechanics Conference, University of Notre Dame, South Bend, IN, June (2010).

B. Sturtevant* and D. S. Corti, "Computational Studies of Lubrication Forces in Model Colloidal Dispersions," Midwest Thermodynamics and Statistical Mechanics Conference, University of Notre Dame, South Bend, IN, June (2010).

B. Sturtevant* and D. S. Corti, "Computational Study of Lubrication Forces Between Colloidal Particles and Planar Surfaces," AIChE National Meeting, Nashville, TN, November (2009).

B. Sturtevant* and D. S. Corti, "Computational Studies of Colloidal Dynamics In Entropic Fields," AIChE National Meeting, Nashville, TN, November (2009).

K. Torabi* and D. S. Corti, "Activated Instability of Homogeneous Nucleation in Metastable Fluids," AIChE National Meeting, Nashville, TN, November (2009).

Y. Park*, R. Huang, D. S. Corti and E. I. Franses, "Stability of DPPC Vesicles in Aqueous Electrolyte Solutions and Comparisons to Predictions from the DLVO Theory," AIChE National Meeting, Nashville, TN, November (2009).

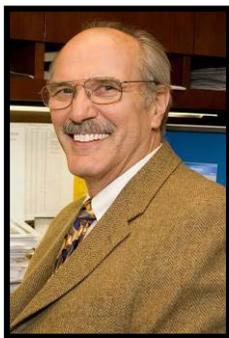
J. Dong*, D. S. Corti, E. I. Franses, Y. Zhao, E. Hanson and H. T. Ng, "Colloidal Dispersion Stability of CuPc Aqueous Dispersions: Effects of Electrostatic and Other Forces," AIChE National Meeting, Nashville, TN, November (2009).

J. Dong, Y. Park, D. S. Corti, E. I. Franses*, Y. Zhao, E. Hanson and H. T. Ng, "DLVO Theory Calculations for Spherical or Cubic Nanoparticles--Some Applications to CuPc Pigments," AIChE National Meeting, Nashville, TN, November (2009).

Uline, M. J. and Corti, D. S. *, "Molecular Simulations in the Isothermal-Isobaric Ensemble: The Requirement of a "Shell" Molecule," *Thermodynamics 2009*, Imperial College London, London, UK, September (2009).



Professor Corti (left) with a group of undergraduate students



W. Nicholas Delgass

Ph. D., Stanford, 1969

Maxine Spencer Nichols Professor

Inaugural North American Catalysis Society Award for Distinguished Service in the Advancement of Catalysis (2010)

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

Editorial Board, *Journal of Catalysis*
Member of the External Advisory Board for the Institute for Environmental Catalysis, Northwestern University

Selected Invited Lectures

"Discovery Informatics: A Model-Based Approach to Catalyst Design", Conference on Catalytic Materials Design, University of Notre Dame, January (2010).

"Understanding and Designing Water Gas Shift Catalysts," Seminar, Chemical Engineering Department, Brigham Young University, Provo, UT, December (2009).

"Design of Catalysts for the Water Gas Shift Reaction," Seminar, Department of Chemical Engineering, University of Washington, Seattle, WA, October (2009).

Selected Publications

Singh, N., Delgass, W. N., Ribeiro, F. H., Agrawal, R., "Estimation of Liquid Fuel Yields from Biomass," *Environmental Science & Technology*, **44**, 5298-5305 (2010).

Novstrup, K.A., Travia, N., Medvedev, G.A., Stanciu, C., Switzer, J., Thomson, K.T., Delgass, W.N., Abu-Omar, M.M. and Caruthers, J.M., "Mechanistic Detail Revealed via Comprehensive Kinetic Modeling of [rac-(C₂H₄(1-Indenyl)₂Zr(Me)₂]-Catalyzed 1-Hexene Polymerization," *Journal of American Chemical Society*, **132** (2), 558-566 (2010).

Krishnamurthy, G., Bhan A., and Delgass, W. N., "Identity and Chemical Function of Gallium species inferred from Microkinetic Modeling Studies of Propane Aromatization over Ga/HZSM-5 Catalysts," *J. Catal.*, **271**, 370-385 (2010).

Chaugule, S. S., Yezerets, A., Currier, N. W., Ribeiro, F. H., Delgass, W. N., "Fast NO_x Storage on Pt/BaO/ γ -Al₂O₃ Lean NO_x Traps with NO₂ + O₂ and NO + O₂: Effects of Pt, Ba Loading" *Catalysis Today*, **151**, 291-303 (2010).

Basu, S., Y. Zheng, Y., Varma, A., Delgass, W. N., and Gore, J. P., "Catalytic Hydrolysis of Ammonia Borane: Intrinsic Parameter Estimation and Validation," *J. Power Sources*, **195**, 1957-1963 (2010).

Guo, N., Finland, B. R., Williams, W. D., Kispersky, V. F., Jelic, J., Delgass, W. N., Ribeiro, F. H., Meyer, R. J., and Miller, J. T., "Determination of CO, H₂O and H₂ Coverage by XANES and EXAFS on Pt and Au During Water Gas Shift Reaction," *Physical Chemistry Chemical Physics*, **12**, 5678 - 5693 (2010).

Agrawal, R., Singh, N. R., Ribeiro, F. H., and Delgass, W. N., Perkis, D. F., Tyner, W. E., "Synergy in the hybrid thermochemical-biological processes for liquid fuel production" *Computers and Chemical Engineering*, **33**, 2012-2017 (2009).

Tan, C. K. C., Delgass, W. N., and Baertsch, C. D., "Spatially resolved in situ FTIR analysis of CO adsorption and reaction on Pt/SiO₂ in a silicon microreactor," *Appl. Catal. B: Environmental*, **93**, 66-74 (2009).

Smeltz, A. D., Delgass, W. N., and Ribeiro, F. H., "Oxidation of NO with O₂ on Pt(111) and Pt(321) large single crystals," *Langmuir* (in press).

Selected Conference Presentation

Shekhar, M., Williams, W. D., Lee, W. S., Delgass, W. N., Ribeiro, F. H., Kim, S. M., Stach, E. A., Miller, J. T., Allard Jr, L. F., "Effect of particle size on Au rutile catalysts for the WGS reaction," Poster, 32nd Annual Michigan Catalysis Society Spring Symposium, Ypsilanti, MI, May (2010).

Kispersky, V. F., Chaugule, S. S., Yezerets, A., Currier, N. W., Ribeiro, F. H., Delgass, W. N., "Formation and Removal of Ba-Carbonates/Carboxylates on Pt/Ba/Al₂O₃ Lean NO_x Traps," Annual Spring symposium of the Michigan Catalysis Society, Ann Arbor, MI, May (2010).

Williams, W. D., Bollmann, L., Ratts, J. L., Miller, J. T., Delgass, W. N., Ribeiro, F. H., "In Situ XAFS and DRIFTS of Palladium Zinc Water-Gas Shift Catalysts," American Institute of Chemical Engineers Annual Meeting, Nashville, TN, November (2009).

Chaugule, S. S., Kispersky, V. F., Ratts, J. R., Yezerets, A., Currier, N. W., Ribeiro, F. H., Delgass, W. N., "Effects of CO₂, H₂O on 'Fast' NO_x Storage on Pt/BaO/ γ -Al₂O₃ Lean NO_x Traps," AIChE Annual Meeting, Nashville, TN, November (2009).



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 Publications

Park, Y., Huang, R., Corti, D. S. and Franses, E. I., "Colloidal Stability of DPPC Vesicles in Aqueous Electrolyte Solutions and Comparisons to Predictions of the DLVO Theory," *J. Colloid Interf. Sci.*, **342**, 300-310 (2010).

Zhao, Y., Ng, H. T., Hanson, E., Dong, J., Corti, D. S., and Franses, E. I., "Computation of Non-Retarded London Dispersion Coefficients and Hamaker Constants of Copper Phthalocyanine," *J. Chem. Theory Comput.* (featured on journal cover), **6**, 491-498 (2010).

Kasat, R. B., Franses, E. I., and Wang, N.-H. L., "Experimental and Computational Studies of Enantioseparation of Structurally Similar Chiral Compounds on Amylose Tris (3,5-DimethylPhenylCarbamate)," *Chirality*, **22**, 565-579 (2010).

Dong, J., Corti, D. S., Franses, E. I., Zhao, Y., Ng, H. T., and Hanson, E., "Colloidal Dispersion Stability of CuPc Aqueous Dispersions and Comparisons to Predictions of the DLVO Theory for Spheres and Parallel Face-to-Face Cubes," *Langmuir*, **26** (10) 6995-7006 (2010).

Park, Y., and Franses, E. I. "Effect of a PEGylated Lipid on the Dispersion Stability and Dynamic Surface Tension of Aqueous DPPC and on the Interactions with Albumin," *Langmuir*, **26** (10) 6932-6942 (2010).

Lozano, N., Pinazo, A., Pons, R., Perez, L., and Franses, E.I., "Surface Tension and Adsorption Behavior of Mixtures of Diacyl Glycerol Arginine-Based Surfactants with DPPC and DMPC Phospholipids," *Colloids Surf. B*, **74**, 67-74 (2009).

Selected Conference Presentations

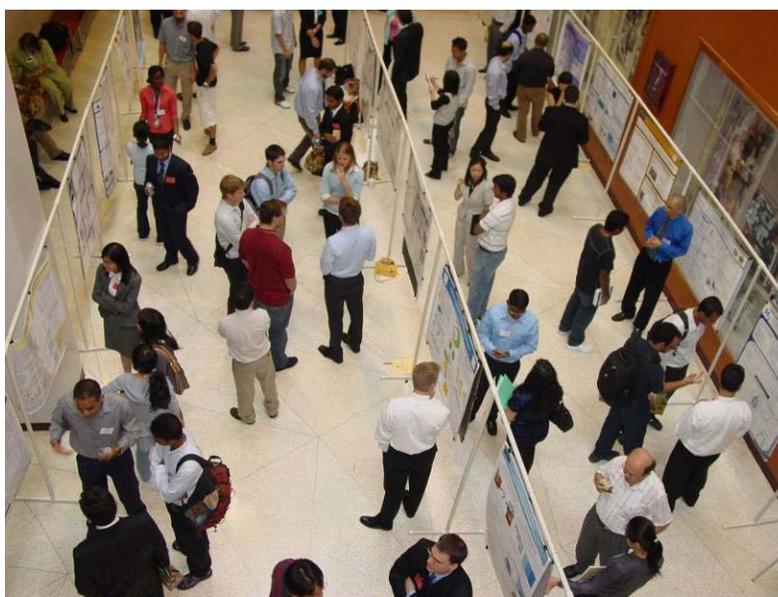
Park, Y.*, Huang, R. and Franses, E. I., "Dynamic Surface Tension and Dispersion Stability," AICHE Annual Meeting, Nashville, TN, November (2009).

Dong, J.*, Corti, D. S., Zhao, Y., Ng, H., Hanson, E. and Franses, E. I., "Colloidal Dispersion Stability of CuPc Aqueous Dispersions: Effects of Electrostatic and Other Forces," AICHE Annual Meeting, Nashville, TN, November (2009).

J., Corti, D. S., Zhao, Y., Ng, H., Hanson, E., and Franses, E. I.*, "DLVO Theory Calculations for Spherical or Cubic Particle—Some Applications to CuPc Pigments," AICHE Annual Meeting, Nashville, TN, November (2009).

Park, Y.*, Corti, D. S., and Franses, E. I., "Stability of DPPC Vesicles in Aqueous Electrolyte solutions and Comparisons to Predictions of the DLVO Theory," AICHE Annual Meeting, Nashville, TN, November (2009).

Park, Y.*, Huang, R., Kim, S. H., and Franses, E. I., "Dispersion Stability and Dynamic Surface Tension of Aqueous Lipid/Protein Dispersions," UKC2009, Raleigh, NC, July (2009).



Poster Session- Fall 2009 GSO Symposium



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

Noble, S.L., Sherer, E., Hannemann, R., Ramkrishna, D., Vik, T., and Rundell, A., "Using Adaptive Model Predictive Control to Customize Maintenance Therapy Chemotherapeutic Dosing for Childhood Acute Lymphoblastic Leukemia", *J. of Theoretical Biology*, **264**, Issue 3, 7, 990-1002, (2010).

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

Selected Publications

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*, **58**, 1030-1038 (2010)



Engineering fountain in front of Forney Hall



Michael T. Harris

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

Professor

Associate Dean for Undergraduate Education

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
Program Chair, AIChE Minority Division
Trustee of AIChE Foundation (2009 to present)
Moderator, Session 1569, “Developing Young MINDS in Engineering – Part II”, ASEE Annual Meeting, Louisville, KY (2010)

Selected Invited Lectures

M. T. Harris, “Surface Mineralization, Alignment, and Programmed-Self Assembly of the TMV Biotemplate,” Department of Chemical and Biomolecular Engineering, University of Illinois Chicago, Chicago, IL, March (2010).

M. T. Harris, “Surface Mineralization, Alignment and Programmed Self-Assembly of the TMV Biotemplate,” Department of Chemical and Biomolecular Engineering, University of Tennessee, Knoxville, TN, December (2009).

Selected Publications

Lim, J. S., Kim, S.-M., Lee, S. Y., Stach, E. A., Culver, J. N., and Harris, M. T., “Quantitative Study of Au(III) and Pd(II) Ion Biosorption on Genetically Engineered Tobacco Mosaic Virus,” *J. Colloid Interface Sci.*, **342**, 455-461 (2010).

Lim, J. S., Kim, S.-M., Lee, S. Y., Stach, E. A., Culver, J. N., and Harris, M. T., “Formation of Au/Pd Alloy Nanoparticles on TMV,” *Journal of Nanomaterials*, **2010** (Article ID 620505), 6 pages (2010).

Bhat, P. P., Appathurai, S., Harris, M. T., Pasquali, M., McKinley, G. H., and Basaran, O. A., “Formation of Beads-on-a-String Structures During Breakup of Viscoelastic Filaments,” *Nature Physics*, **6**, 625-631 (2010).

Zhu, Q., Taylor, L. S., and Harris, M. T., “Evaluation of the Microstructure of Semicrystalline Solid Dispersions,” *Molecular Pharmaceutics* (in press).

Selected Conference Presentations

Lim, J. S., Kim, S. M., Lee, S. Y., Stach, E. A., Culver, J. N., and Harris, M. T., “Palladium Complexation on Amine/Thiol Moieties, Leading to the Full Layered Growth on the Tobacco Mosaic Virus,” MRS Spring Meeting, April (2010).

Lim, J.S., Lee, S.Y., Culver, J.N. and Harris, M. T., “Investigation of Palladium Sorption On the Hydroxyl, Sulfhydryl, and Amine Functionality to Improve the Palladium Deposition On the Genetically Engineered Tobacco Mosaic Virus,” 624d, AIChE Annual Meeting, November (2009).

Harris, M. T., Appathurai, S., Bhat, P. and Basaran, O.A., “Dynamics of Contracting Viscoelastic Filaments,” GH.00010, APS Meeting, November (2009).

Bhat, P., Appathurai, S., Harris, M. T., Pasquali, M., McKinley, M. and Basaran, O. A., “Formation of Beads-on-a-String Structures during the Pinch-Off of Viscoelastic Filaments,” HN.00004, APS Meeting, November (2009).

Gao, H., Xu, Q., Harris, M. T., Basaran, O. A., “Production of Ultra-Small Ink Jet Drops Using Drop-on-Demand (DOD) Drop Formation,” GH.00007, APS Meeting, November (2009).

Sambath, K., McGough, P., Appathurai, S., Bhat, P., Harris, M. T., and Basaran, O. A., “Effect of Initial Shape on Contraction Dynamics of Newtonian Filaments,” GH.00012, APS Meeting, November (2009).

Appathurai, S., Bhat, P., Harris, M. T., Pasquali, M., and Basaran, O. A., “On the Evolution of Drop-Filament Corner Region During the Pinch-Off of Viscoelastic Fluids,” HN.00005, APS Meeting, November (2009).

Pommer, C., Suryo, R., Subramani, H., Harris, M. T., and Basaran, O. A., “Scaling in Two-Fluid Pinch-Off,” GH.00004, APS Meeting, November (2009).

McGough, P., Sambath, K., Appathurai, S., Bhat, P., Harris, M. T., and Basaran, O. A., “Contraction of Assymmetric Newtonian Liquid Filaments,” GH.00001, APS Meeting, November (2009).

Zhu, Q., Taylor, L. and Harris, M. T., “Solid-State Structure of Drug/Polyethylene Glycol Dispersions,” AAPS Meeting, November (2009).

Intellectual Property

Metal Coated Virus-Based Nanoelectrodes and Method of Assembling of Same, (Patent Application No. **20100093562**, April 15, 2010.



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

Selected Invited Lectures

The Sino-US advanced Biofuel Forum, Beijing, China, May 26-27, 2010 “A Successful Story: From University Research to Industrial Application”

Khan A., Sedlak, M., Bera, A., Alope K., and Ho, N. W. Y., “Modulation of pentose sugar transport by Gal1,” *Saccharomyces cerevisiae*. 31th Symposium on Biotechnology for Fuels and Chemicals,” Clearwater Beach, FL, April (2010).

Selected Publications

Casey, E., Sedlak, M., Ho, N. W. Y., Mosier, N. S., “Effect of acetic acid and pH on the co-fermentation of glucose and xylose to ethanol by a genetically engineered strain of *Saccharomyces cerevisiae*,” *FEMS Yeast Res.* **10**(4): 385-393 (2010).

Bera A. K., Sedlak, M., Khan, A., and Ho, N. W. Y., “Establishment of L-rabinose fermentation in *Saccharomyces cerevisiae* 424A(LNH-ST) by Genetic Engineering,” *Appl. Microbiol. Biotech.* **87**(5):1803-1811 (2010).

Bera, A. K., Ho, N. W. Y., Khan, A., and Sedlak, M., “A genetic overhaul of *Saccharomyces cerevisiae* 424A(LNH-ST) to improve xylose fermentation,” *Journal of Industrial Microbiology & Biotechnology* (DOI: 10.1007/s10295-010-0806-6) (in press).

Selected Conference Presentations

Wu, C-L., Mosier, N. S. Adamec, J., Ho, N. W. Y., Sedlak, M., “System biology approach to determine differences between acetic acid tolerant *S. cerevisiae* 424A(LNH-ST) and original *S. cerevisiae* 424A(LNH-ST) during glucose/xylose fermentation,” 31th Symposium on Biotechnology for Fuels and Chemicals, Clearwater Beach, FL, April (2010).

Kim, J-H., Adamec, J., Mosier, N. S., Ho, N. W. Y., Sedlak, M., “Gene Expression Analysis and Lipidomics of *S. cerevisiae* 424A (LNH-ST) and Ethanol Resistant *S. cerevisiae* 424A (LNH-ST),” 31th Symposium on Biotechnology for Fuels and Chemicals, Clearwater Beach, FL, April (2010).

Casey, E., Sedlak, M., Ho, N. W. Y. H., and Mosier, N. S., “Transcriptomic Analysis of the Effect of Acetic Acid on *S. cerevisiae* 424A(LNH-ST) during the Co-fermentation of Glucose and Xylose,” 31th Symposium on Biotechnology for Fuels and Chemicals, Clearwater Beach, FL, April (2010).

Bera, A. K., Sedlak, M., Khan, A., and Ho, N. W. Y., “A Genetic Overhaul of *Saccharomyces cerevisiae* 424A(LNH-ST) to improve xylose fermentation,” 31th Symposium on Biotechnology for Fuels and Chemicals, Clearwater Beach, FL, April (2010).



Professor Ho (right) in the audience at the Chemical Engineering of the Future Symposium



R. Neal Houze

Ph. D., University of Houston, 1968

Professor

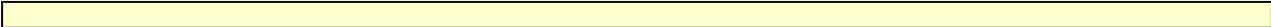
Conoco Phillips Faculty Fellow, 2009-10

Selected Professional Activities

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



Professor Houze (left) at a School event with Professor Varma



Sangtae Kim

Ph. D., Princeton, 1983

Donald W. Fedderson Distinguished Professor (on leave)

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.



James D. Litster

Ph. D., University of Queensland, 1985

**Professor of Chemical Engineering and Industrial and Physical Pharmacy
Director of Graduate Studies, Chemical Engineering
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

Honorary Professor, The University of Queensland
Member, Solae LLC (St Louis) Scientific Advisory Board
Fellow, Institution of Chemical Engineers (UK)
Consultant, International Fine Particle Research Institute
Powder Technology Editorial Board (2002-present)
Particle and Particulate Systems Characterisation Editorial
Board (2003-present)
AAPS Pharmaceutical Science and Technology Editorial
Board (2009-present)

Selected Invited Lectures

“Towards Quantitative Engineering Design of Wet
Granulation Processes: Current State and Future Vision”
Max Planck Institute for Complex Systems, Magdeburg,
Germany, April (2010).

“Towards Quantitative Engineering Design of Wet
Granulation Processes: Current State and Future Vision”
University of Florida, FL, November (2009).

“Towards Quantitative Engineering Design of Wet
Granulation Processes: Current State and Future Vision”
University of Queensland, August (2009).

“Towards Quantitative Engineering Design of Wet
Granulation Processes” J&J Pharmaceuticals, New Jersey, NJ,
November (2009).

“Alice in Wonderland – A Personal Journey through the
World of Particle Technology” Procter and Gamble,
Newcastle-on-Tyne, UK, June (2009).

Selected Publications

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 J*, **79-91**, 56(1) (2010).

Freireich, B., Litster, J.D., Wassgren, C., “Using the discrete
element method to predict collision-scale behavior: A
sensitivity analysis”, *Chemical Engineering Science*, **64**, 3407
– 3416 (2009).

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

Ramachandran, R., Immanuel, C. D., Stepanek, F., Litster,
J.D., Doyle III, F. J., “A mechanistic model for breakage in
population balances of granulation: Theoretical kernel
development and experimental Validation,” *Chemical
Engineering Research and Design Part A*, **87**(4), 598-614
(2009).

Smith, R.M., Liu L.X. and Litster, J.D., “Breakage of drop
nucleated granules in a breakage only high shear mixer,”
Chemical Engineering Science (in press).

Selected Conference Presentations

Kayrak-Talay, D., Emady, H., Schwerin, W., and Litster, J.D.,
“Design and Operation of a regime separated granulation
system,” 6th World Congress on Particle Technology,
Nuremberg, Germany, April (2010).

van der Hoeven, M., Howes, T., Litster, J.D. and Cameron,
I.T., “ Particle impact experiments for validation of
agglomeration penetration regime map,” 6th World Congress
on Particle Technology, Nuremberg, Germany, April (2010).

Emady, H., Kayrak-Talay, D., Litster, J.D. and Schwerin, W.
“Investigation of nucleation mechanisms for regime separated
granulation,” 6th World Congress on Particle Technology,
Nuremberg, Germany, April (2010).

Ye, M., McCann, R., Fong, G-Y., Giridhar, A., Hamdan, I.,
Vanarase A. U., Engisch Jr., W. E., Ierapetritou, M. G.,
Muzzio, F. J., Ramachandran, R., Reklaitis, G.V., Litster, J.D.,
“The Development of Continuous Table Manufacture Using
Roll Compaction,” AIChE Annual Meeting, Nashville, TN,
November (2009).

Kayrak-Talay, D., Drennan, J. and Litster, J.D.”Quantitative
Approach to Determine Optimum Operating Conditions in
High Shear Granulation”, AIChE Annual Meeting, Nashville,
TN, November (2009).

Kayrak-Talay, D., Emady, H., Schwerin, W. and Litster, J.D.,
“Nucleus Formation Mechanisms Towards Design of Regime
Separated Granulation,” AIChE Annual Meeting, Nashville,
TN, November (2009).

Plenary: Litster J.D. and Kayrak-Talay, D., “Towards
Quantitative Engineering Design of Wet Granulation
Processes: Current State and Future Vision,” 6th International
Symposium on Conveying and Handling of Bulk Solids,
Brisbane, Australia, August (2009).

Book chapters

Hapgood, KP and Litster, JD (2010). Chapter 39 *Wet
Granulation Processes in Chemical Engineering in the
Pharmaceutical Industry: R&D to Manufacturing*, David J am
Ende (Ed.), John Wiley & Sons inc, New York.

He, Y, Liu, LX, **Litster JD** and Kayrak-Talay, D (2009).
Chapter 16 *Scale-up Consideration in Granulation*, In
Handbook of Pharmaceutical Granulation Technology (3rd
Edition, D.M. Parikh Ed.), Marcel Dekker, Inc., New York.



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

Assistant Professor

Research Areas
Biomaterials, Tissue Engineering, Protein Engineering

Professional Activities

NSF Biomedical Eng. review panel, reviewer, May 2009, Oct 2009, May 2010

American Institute of Chemical Engineers

- Session co-chair, Injectable Biomaterials, Nov 2009
- Session co-chair, Polymers as Functional Components of Micro- and Nanodevices, Nov 2009
- Women's Initiatives Committee, vice chair, Nov 2009 – Nov 2010
- 2010 Panel co-organizer, After My Degree – Industry or Academia, April 2010
- 2010 abstract reviewer for Biomimetics

Selected Publications

Jones, M., Liu, J.C., Barthel, T.K., Hussain, S., Lovria, E., Cheng, D., Schoonmaker, J.A., Mulay, S., Ayers, D.C., Bouxsein, M.L., Stein, G.S., Mukherjee, S., Lian, J.B., "A Proteasome Inhibitor, Bortezomib, Inhibits Breast Cancer Growth and Reduces Osteolysis by Downregulating Metastatic Genes," *Clin. Cancer Res.* (in press).

Selected Conference Presentations

Kadrmaz, J.N. and Liu, J.C., "Peptide-Based Cues for Mesenchymal Stem Cell Differentiation into Cartilage," Society for Biological Engineering's second International Conference on Stem Cell Engineering, Boston, MA, Biomaterials for Directed Stem Cell Differentiation poster session, May (2010).

Kadrmaz, J.N. and Liu, J.C., "Material-Based Cues that Influence Mesenchymal Stem Cell Differentiation for Use in Cartilage Scaffolds," annual meeting of the Society for Biomaterials, Seattle, WA, Biomaterials for Directed Stem Cell Differentiation poster session, April (2010).

Kadrmaz, J.N. and Liu, J.C., "Development of a Resilin-Based Artificial Protein for Application in Cartilage Engineering," annual meeting of the American Institute of Chemical Engineers, Nashville, TN, Session 77: Biomimetic Materials, 77a, November (2009).

Kadrmaz, J.N. and Liu, J.C., "Bioactive Cues That Influence Mesenchymal Stem Cell Differentiation for Use in Cartilage Tissue Engineering," annual meeting of the American Institute of Chemical Engineers, Nashville, TN, Session 685: Biomaterials for Stem Cell Expansion and Differentiation, 685d, November (2009).

Liu, J.C., "Protein-Based Scaffolds in Tissue Engineering Applications," invited oral presentation at Biomaterials Day: "Advances in Bioactive Materials and Interfaces for Therapeutics and Diagnostics" sponsored by the Society for Biomaterials and organized by University of Kentucky and Case Western Reserve University, Lexington, KY, Session 3, September (2009).

Liu, J.C., Lengner, C.J., Gaur, T., Lou, Y., Hussain, S., Jones, S.N., van Wijnen, A.J., Stein, J.L., Stein, G.S., and Lian, J.B., "Developmental Expression and Activities of Runx2 Isoforms In Vivo," Bones & Teeth Gordon-Kenan Research Seminar: Advances in the Understanding of Bone and Cartilage Development, Biddeford, ME, July (2009).



Professor Liu (left) with Lindsay Williams, a scholarship recipient senior



John A. Morgan

Ph. D., Rice, 1999

Associate Professor

Visiting Associate Professor of Chemical Engineering,
National Taiwan University, Fall 2009

Research Areas: Metabolic Engineering, Biocatalysis

Selected Professional Activities

Associate Editor, Bioprocess and Biosystems Engineering
Invited Site Reviewer for Singapore's A*STAR program
Programming Vice-Chair AIChE, National Meeting Division
15 (2010)

Selected Invited Lectures

"Prediction and determination of metabolic fluxes in photosynthetic microbes," Chemical and Biological Engineering and Genetics, Development and Cell Biology, Iowa State University, Ames, IA, February (2010).

"Metabolic Flux Analysis of Photosynthetic Aquatic Organisms," Solazyme, South San Francisco, CA, November (2009).

"Metabolic flux analysis of photosynthetic microorganisms," Chemical Engineering Department, National Cheng Kung University, Tainan, Taiwan, R.O.C., November (2009).

"Engineering flavonoid biosynthesis in yeast." National Dong Hua University, Biotechnology Department, Hua Lien, Taiwan, R.O.C., November (2009).

"Metabolic flux analysis of carbon fixation in single celled organisms," National Taiwan University, Chemical Engineering Department, Taiwan, R.O.C., October (2009).

Selected Publications

Marshall-Colon, A., Sengupta, N., Rhodes, D., Dudareva, N. and Morgan, J.A., "A Kinetic Model Describes Metabolic Response to Perturbations and Distribution of Flux Control in the Benzenoid Network of *Petunia hybrid*," *Plant Journal* **62**, 64-76 (2010).

Werner, S. Chen, H., Jiang, H., and Morgan, J.A., "Synthesis of non-natural flavanones and dihydrochalcones in metabolically engineered yeast," *J. Mol. Catal. B:Enzymatic*, **66**, 257-263 (2010).

Werner, S. and Morgan, J., "Controlling Selectivity and Enhancing Yield of Flavonoid Glycosides in Recombinant Yeast," *Bioprocess and Biosystems Engineering*, **33**, 863-871 (2010).

Sengupta, N., Rose, S. and Morgan, J.A., "C Flux analysis of CHO cell metabolism in non growth phase for recombinant protein production," *Biotechnology and Bioengineering* (in press).

Selected Conference Presentations

Werner, S. and Morgan, J., "Expression of a Dianthus Flavonoid Glucosyltransferase in *Saccharomyces Cerevisiae* for Whole-Cell Biocatalysis," AIChE National Meeting, Nashville, TN, November (2009).

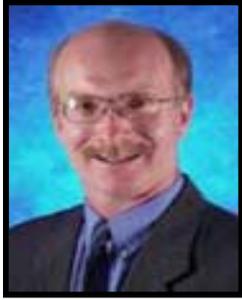
Sengupta, N. and Morgan, J., "13C Flux Analysis of CHO Cell Metabolism Over Entire Cell Culture Phase for Recombinant Protein Production" AIChE National Meeting, Nashville, TN, November (2009).

Sengupta, N., Marshall-Colon, A., Dudareva, N., Rhodes, D. and Morgan, J., "Kinetic Modeling of the Phenylpropanoid Pathway in *Petunia Hybrid*," AIChE National Meeting, Nashville, TN, November (2009).

Morgan, J.A., "In silico prediction and experimental measurements of metabolic fluxes in photosynthetic organisms," International Conference on Mathematical Biology, Vancouver, B.C., July (2009).



Professor Morgan in the lab



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 Professional Activities

Member of the Purdue Global Policy Research Institute
Co-Leader of the Systems Engineering Task Force/Systems of Systems Institute Working Group for the College of Engineering

Selected Invited Lectures

“Preparing the PEV Workforce, The Business of Plugging In,”
A Plug-In Electric Vehicle Conference, Detroit, MI, October (2010).

Selected Publications

Miller, D. L., Schertz, D. S., Stevens, C., and Pekny, J. F.,
“Mathematical Programming for the Design and Analysis of a
Biologics Facility,” *BioPharm International*, **23** (2), 26-38
(2010).

Miller, D. L., Schertz, D. S., Stevens, C., and Pekny, J. F.,
“Mathematical Programming for the Design and Analysis of a
Biologics Facility – Part 2,” *BioPharm International*, **23** (3),
40-52 (2010).

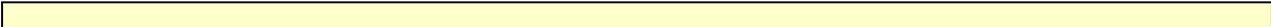
Selected Conference Presentations

Hodge, B.M., Huang, S., Shukla, A., Pekny, J., and Reklaitis, G.V., “The Effects of Vehicle-to-Grid Systems on Wind Power Integration in California,” 20th European Symposium on Computer Aided Process Engineering, Ischia, Italy, June, (2010).

Huang, S., Hodge, B.M., Pekny, J., and Reklaitis, G.V., “The Value of Battery Storage and Discharge Logic with Solar Microgeneration,” 20th European Symposium on Computer Aided Process Engineering, Ischia, Italy, June, (2010).

Hodge, B.M., Huang, S., Pekny, J., and Reklaitis, G.V.,
“Process Systems Engineering Perspectives on Energy
Systems Analysis and Policy,” Second International
Symposium on Sustainable Chemical Product and Process
Engineering, Hangzhou, China, May (2010).

Huang, S., Hodge, B.M., Pekny, J., and Reklaitis, G.V., “The Impact of PHEV Adoption on Natural Gas Demand in Electricity Generation,” 2nd Annual Gas Processing Symposium, Doha, Qatar, January (2010).



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

John Leighton Bray Distinguished Professor
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
Fellow, American Society of Composites
Member, NRC Committee Panel on Building and Fire
Research

Selected Publications

Pipes, R. B., Goodsell, J., Ritchey, A., Dustin, J. and Gosse, J.,
“Interlaminar Stresses in Composite Laminates: Thermoelastic
Deformation,” *Composites Science and Technology*, **70**, 1605-
1611 (2010).



Doraiswami Ramkrishna

Ph. D., University of Minnesota, 1965

H. C. Peffer Distinguished Professor

Member, National Academy of Engineering

Research Areas

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

Selected Professional Activities

Member Advisory Council, Pacific Northwest National Laboratory, Richland, WA

Selected Invited Lectures

“The Metabolic Modeling Landscape,” National Chemical Laboratory, Pune, India, May 4 (2010).

“The Metabolic Modeling Landscape,” Department of Chemical Engineering, Indian Institute of Technology, Mumbai, India, March (2010).

“On Dynamic Modeling of Metabolism,” Department of Chemical Engineering, Indian Institute of Technology, Kanpur, India, February (2010).

“The Metabolic Modeling Landscape,” Pacific Northwest National Laboratories, Richland, WA, Biological Sciences Facility, December (2009).

On Dynamic Modeling of Metabolism,” Pacific Northwest National Laboratories, Richland, WA, Computational Sciences Facility, December (2009).

“On Dynamic Modeling of Metabolism,” Department of Chemical Engineering, Cornell University, Ithaca, NY, November (2009).

“On Dynamic Modeling of Metabolism,” Joint Bioenergy Institute, Emeryville, CA, October (2009).

“On Dynamic Modeling of Metabolism,” Department of Chemical Engineering, University of California at Berkeley, CA, September (2009).

“On Dynamic Modeling of Metabolism,” Department of Chemical Engineering, University of California at Santa Barbara, CA, October (2009).

Selected Publications

Song, Hyun-Seob and Ramkrishna, D., “Prediction of Metabolic Function from Limited Data: Lumped Hybrid Cybernetic Modeling (L-HCM),” *Biotechnol & Bioeng.* **106**, 271-284 (2010).

Noble, S. L., Sherer, E., Hannemann, R.E., Ramkrishna, D., Vik, T. and Rundell, A.E., “Using adaptive model predictive control to customize maintenance therapy chemotherapeutic dosing for childhood acute lymphoblastic leukemia,” *J. Theoretical Biol.*, **264**, 990-1002 (2010).

Wong, W. C., Song, H-S., Lee, J. H., and Ramkrishna, D., “Hybrid Cybernetic Model-Based Simulation of Continuous Production of Lignocellulosic Ethanol: Rejecting Abruptly Changing Feed Conditions,” *Control Engineering Practice*, **18**, 177-189 (2010).

Song, H-S. and Ramkrishna, D., “Issues with Increasing Bioethanol Productivity: A Model Directed Study,” *Korean J. Chem. Eng.* (Jae-Chun Hyun Special issue), **27**, 576-586, (2010).

Chakraborty, J. and Ramkrishna, D., “On Identification of Markov Matrices of Milling Models,” *Ind. Eng. Chem.* (Kulkarni issue), **48**, 9763-9771 (2009).

Chakraborty, J., Singh, Meenesh, Ramkrishna, Doraiswami, Borchert, Christian and Sundmacher, Kai, “Population Balance Modeling of Faceted Solids. Morphological Evolution of Asymmetric Crystals under Pure Growth,” *Chem. Eng. Sci.* (in press).

Selected Conference Presentations

Song, H-S. and Ramkrishna, D., “Robustness of Metabolic Networks: Some Fresh Insights,” Paper #47c, AIChE Annual Meeting, Nashville, TN, November (2009).

Franz, A., Song, H-S., Kienle, A., and Ramkrishna, D., “Modeling of PHB Synthesis and Degradation in Microorganisms Using the Hybrid Cybernetic Approach,” Paper #182e, AIChE Annual Meeting, Nashville, TN, November (2009).

Chakraborty, J. and Ramkrishna, D., “Markov Chain Modeling of Milling Processes,” Paper #299b, AIChE Annual Meeting, Nashville, TN, November (2009).

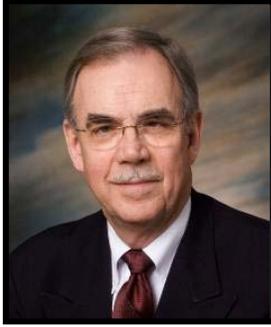
Song, H-S. and Ramkrishna, D., “Network-Based Prediction of Metabolic Fluxes Using the Cybernetic Control Principle,” Paper #418c, AIChE Annual Meeting, Nashville, TN, November (2009).

Song, H-S. and Ramkrishna, D., “The Metabolic Modeling Landscape,” (Invited Session) Paper #316a, AIChE Annual Meeting, Nashville, November (2009).

Won, H., Song H-S., and Ramkrishna, D., “Cybernetic Modeling of the Metabolic Homeostasis of the Liver,” Paper 489o (Poster), AIChE Annual Meeting, Nashville, TN, November (2009).

Song, H-S. and Ramkrishna, D., “Steady State and Hopf Bifurcations in Bioreactors with Mixed Feeds,” Paper #689a, AIChE Annual Meeting, Nashville, TN, November (2009).

Ramkrishna, D., Ramalingam, S. and Basaran, O., “Small Oscillations of a Drop Pinned at an Azimuth,” American Physical Society, Minneapolis, MN., November (2009).



Gintaras V. "Rex" Reklaitis

Ph. D., Stanford University, 1969

Burton and Kathryn Gedge Distinguished Professor

George Lappin Award, National Program Committee, AIChE (2010)

Member, National Academy of Engineering

Co-director, Pharmaceutical Technology & Education Center

Deputy Director, NSF ERC on Structured Organic Composites

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

US National Academy of Engineering, Section 3 Peer Committee, 2010-2012

AIChE Foundation, Board of Trustees, 2010-2012

Smart Process Manufacturing, Steering Committee, NSF EVO, 2007-present

National Institute for Pharmaceutical Technology & Education, Purdue representative, 2005- present

Editorial Advisory Boards

- Computers & Chemical Engineering
- Journal of Pharmaceutical Innovation
- Computer Applications in Engineering Education
- Journal of Process Systems Engineering

Selected Invited Lectures

"Approaches to Energy Systems Modeling, Simulation and Analysis," Polytechnic University of Catalunya, Department of Chemical Engineering, Barcelona, Spain, January (2010).

"Process Systems Engineering Approaches to Enterprise-wide Decision Problems," Rensselaer Polytechnic Institute, Department of Chemical and Biological Engineering, September (2009).

Selected Publications

Zapata, J.C. and Reklaitis, G. V., "Valuation of Project Portfolios: An endogenously discounted method," *European J. of Operations Research*, **206**, No 3, 1 653-666 (2010).

Hsu, S-H., Reklaitis, G. V., and Venkatasubramanian, V., "Modeling and Control of Roller Compaction for Pharmaceutical Manufacturing. Part I: Process Dynamics and Control Framework," *J. Pharmaceutical Innovation*, **5**, No.1-2, 14-23 (2010).

Hsu, S-H., Reklaitis, G. V., and Venkatasubramanian, V., "Modeling and Control of Roller Compaction for Pharmaceutical Manufacturing. Part II: Control System Design," *J. Pharmaceutical Innovation*, **5**, No.1-2, 24-36 (2010).

Suresh, P., Hsu, S-H., Akkisetty, P., Reklaitis, G.V., and Venkatasubramanian, V., "OntoMODEL: Ontological Mathematical Modeling Knowledge Management in Pharmaceutical Product Development. 2: Applications," *I&EC Research*, **47**, No.17, 7768-81 (2010).

Suresh, P., Hsu, S-H., Akkisetty, P., Reklaitis, G.V., and Venkatasubramanian, V., "OntoMODEL: Ontological Mathematical Modeling Knowledge Management in Pharmaceutical Product Development. 1: Framework," *I&EC Research*, **49**, No.17, 7758-67 (2010).

Kuriyan, K, Catlin, A.C. and Reklaitis, G.V., "pharmaHUB: Building a Virtual Organization for Pharmaceutical Engineering and Science," *J. Pharmaceutical Innovation*, **4**, No.2, 81-89 (2009).

Hamdan, I., Venkatasubramanian, V. and Reklaitis, G. V., "Exceptional Events Management applied to Roller Compaction of Pharmaceutical Powders," *J. Pharmaceutical Innovation* (in press).

Lainez, J. M., Reklaitis, G. V. and Puigjaner, L., "Linking marketing and supply chain models for improved business strategic decision support," *Comput. & Chem Engr* (in press).

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

Selected Conference Presentations

Plenary Lecture: Reklaitis, G. V., "Process Systems Engineering Perspectives on Energy Systems Analysis and Policy," 2nd International Symposium on Sustainable Chemical Product and Process Engineering, Hangzhou, China, May (2010).

Invited lecture: Reklaitis, G. V. "PharmaHUB: Status and Prospects," HUBub 2010 – Workshop for the HUBzero Community, Indianapolis, IN, April (2010).

Invited lecture presented by Venkatasubramanian, V.: Reklaitis, G. V., and Venkatasubramanian, V., "Continuous Manufacturing of Drug Products: Academic Perspective," FDA Symposium on Continuous Manufacturing for Pharmaceuticals, Silver Spring, MD, March (2010).

Invited: Reklaitis, G. V., Arastopour, H., Bogner, R., Drennen, J., Kirsch, L., Litster, J., Munson, E., Muzzio, F., Suryanarayanan, R., Hoag, S., Khan, M., "NIPTE-FDA Collaborative Case Study on Model-based Design Space Development across scales and with Stability Considerations," paper 382c, AIChE Annual Meeting, Nashville, TN, November (2009).

Keynote lecture: Reklaitis, G.V., "Process Systems Engineering: Accomplishments & Opportunities," 10th International Process Systems Engineering Symposium, Salvador, Brazil, August (2009).

Invited lecture presented by V. Venkatasubramanian: Reklaitis, G.V., "Modeling Challenges in Pharmaceutical Engineering," World Congress of Chemical Engineering, Montreal, August (2009).



Fabio H. Ribeiro
Ph. D., Stanford University, 1989

Professor

Purdue University Faculty Scholar (2006 – 2011)

Research Areas

Surface Science and Kinetics of Heterogeneous Catalytic Reactions

Selected Professional Activities

Member of the Editorial Board for Applied Catalysis B: Environmental
Member of the Editorial Board for Catalysis Letters
Vice-chair of the Catalysis and Reaction Engineering Division AICHE (2009)
Chair of the Catalysis and Reaction Engineering Division AICHE (2010)
Editor Journal of Catalysis

Selected Invited Lectures

"Catalysis on a crowded surface: the role of surface oxygen on NO oxidation over Pt", University of Houston, TX, January (2010).

"Catalysis on a crowded surface: the role of surface oxygen on NO oxidation over Pt", Yale University, New Haven, CT, February (2010).

Selected Publications

Singh, N., Delgass, W. N., Ribeiro, F. H., Agrawal, R., "Estimation of Liquid Fuel Yields from Biomass," *Environmental Science & Technology*, **44** (13), 5298–5305, (2010).

Setthapun, W., Williams, W. D., Kim, S.M. Min, Feng, H., Elam, J. W., Rabuffetti, F. A., Poeppelmeier, K. R., Stair, P. C., Stach, E. A., Ribeiro, F. H., Miller, J. T., and Marshall, C. L., "Genesis and evolution of surface species during Pt atomic layer deposition on oxide supports characterized by in-situ XAFS analysis and water-gas shift reaction," *Journal of Physical Chemistry C*, **114** (21), 9758–9771 (2010).

Chaugule, S. S., Yezerets, A., Currier, N. W., Ribeiro, F. H., Delgass, W. N., "Fast NO_x Storage on Pt/BaO/γ-Al₂O₃ Lean NO_x Traps with NO₂ + O₂ and NO + O₂: Effects of Pt, Ba Loading," *Catalysis Today*, **151**, 291–303 (2010).

Guo, N., Fingland, B. R., Williams, W. D., Kispersky, V. F., Jelic, J., Delgass, W. N., Ribeiro, F. H., Meyer, R. J., and Miller, J. T. "Determination of CO, H₂O and H₂ Coverage by XANES and EXAFS on Pt and Au During Water Gas Shift Reaction," *Physical Chemistry Chemical Physics*, **12**, 5678 – 5693 (2010).

Fingland, B. R., Ribeiro, F. H., and Miller, J. T. "Simultaneous measurement of x-ray absorption spectra and kinetics: a fixed-bed, plug-flow operando reactor," *Catalysis Letters*, **131**, 1–6 (2009).

Barbosa, L.A.M.M. and Ribeiro, F. H., "Theoretical study of the stability of carbene intermediates formed during the hydrodechlorination reaction of the CF_xCl_{4-x} family on the Pd(110) surface," *Catalysis Letters*, **133**, 243-255 (2009).

Agrawal, R., Singh, N. R., Ribeiro, F. H., and Delgass, W. N., Perkis, D. F., Tyner, W. E., "Synergy in the hybrid thermochemical–biological processes for liquid fuel production," *Computers and Chemical Engineering*, **33**, 2012–2017 (2009).

Smeltz, A. D., Delgass, W. N., and Ribeiro, F. H. "Oxidation of NO with O₂ on Pt(111) and Pt(321) large single crystals," *Langmuir* (in press).

"Kinetic and Theoretical Study of the Hydrodechlorination of CH_{4-x}Cl_x (x = 1-4) Compounds on Palladium," Nan Chen, Robert M. Rioux, Luis A. M. M. Barbosa, Fabio H. Ribeiro, *Langmuir* (in press).

Williams, W. D., Shekhar, M., Lee, W.-S., Kispersky, V. F., Delgass, W. N., Ribeiro, F. H., Kim, S. M., Stach, E. A., Miller, J. T., Allard, L. F., "Metallic Corner Atoms in Gold Clusters Supported on Rutile are the Dominant Active Site during Water-Gas Shift Catalysis," *Journal of the American Chemical Society* (in press).

Selected Conference Presentations

Ribeiro, F.H., "Using Model Catalysts and Dynamic Methods to Address Emerging Challenges in Catalysis," IDECAT Conference on Catalysis, Porquerroles, France, May (2010).

Fingland, B. R., Dietrich, P. J., Ribeiro, F. H., Guo, N., Dumesic, J. A., Miller, J. T., Frontiers in Bioenergy Symposium 2010, "Liquid phase operando X-ray absorption spectroscopy (XAS): Glycerol reforming over a Pt-Mo/C catalyst," Purdue University, IN, May (2010).

Agrawal, R., McCann, M. C., Carpita, N. C., Abu-Omar, M., Ribeiro, F. H., Poster Presentation, "EFRI-HyBi: Maximizing Conversion of Biomass Carbon to Liquid Fuel" Sustainable Production of Transportation Fuels and Chemicals: Challenges and Opportunities, Oostende, Belgium, April (2010).

Ribeiro, F. H., "Effect of Pt structure on the kinetics of NO oxidation as studied by Pt(321) and Pt(111) large single crystals and supported clusters from 2-9 nm," George A. Olah Award in Hydrocarbon or Petroleum Chemistry: Symposium in Honor of Peter C. Stair, The 239th ACS National Meeting, San Francisco, CA (2010).



Kendall T. Thomson

Ph. D., University of Minnesota, 1999

Associate Professor

Purdue University Faculty Scholar (2008-2013)

Shreve Teaching Award 2010

Research Areas

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

Selected Publications

Novstrup, K.A., Travia, N., Medvedev, G.A., Stanciu, C., Switzer, J., Thomson, K.T., Delgass, W.N., Abu-Omar, M.M. and Caruthers, J.M., "Mechanistic Detail Revealed via Comprehensive Kinetic Modeling of [rac-(C₂H₄(1-Indenyl)₂Zr(Me)₂]-Catalyzed 1-Hexene Polymerization," *Journal of American Chemical Society*, **132** (2), 558-566 (2010).



Fall outside Forney Hall



Arvind Varma
Ph. D., Minnesota, 1972

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

Elected Foreign Member, Academy of Engineering, Mexico 2010

**Research Areas: Chemical and Catalytic Reaction Engineering,
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, GCEP Proposal Review Panel, Stanford University,
April 2010
Chair, Plenary Session – 1, International Symposium on
Chemical Reaction Engineering-21, Philadelphia, PA, June
2010
Member, Organizing Committee, ISCRE-21, Philadelphia,
PA, June 2010
Chair, Amundson Award Committee, ISCRE, 2010

Selected Invited Lectures

Department of Chemical Engineering, Lamar University,
Beaumont, TX, April (2010).

Distinguished Engineering Lecture, Univ. of Western Ontario,
March (2010).

Department of Chemical Engineering, University of Texas,
Austin, TX, September (2009).

MATRIC, Inc, South Charleston, WV, August (2009).

Selected Publications

Diwan, M., Hanna, D., and Varma, A., "Method to Release
Hydrogen from Ammonia Borane for Portable Fuel Cell
Applications," *International Journal of Hydrogen Energy*, **35**,
577-584 (2010).

Diwan, M., Hanna, D., Shafirovich, E., and Varma, A.,
"Combustion Wave Propagation in Magnesium/Water
Mixtures: Experiments and Model," *Chemical Engineering
Science*, **65**, 80-87 (2010).

Reeves, R. V., White, J. D.E, Dufresne, E. M., Fezzaa, K.,
Son, S. F., Varma, A. and Mukasyan, A. S., "Microstructural
Transformations and Kinetics of High-Temperature
Heterogeneous Gasless Reactions by High-Speed X-Ray
Phase Contrast Imaging," *Physical Review B*, **80**, 224103-1 to
-8 (2009).

Basu, S., Zheng, Y., Varma, A., Delgass, W.N., and Gore, J.
P., "Catalytic Hydrolysis of Ammonia Borane: Intrinsic
Parameter Estimation and Validation," *Journal of Power
Sources*, **195**, 1957-1963 (2010).

Basu, S., Diwan, M., Abiad, M. G., Zheng, Y. O., Campanella,
H., and Varma, A., "Transport Characteristics of
Dehydrogenated Ammonia Borane and Sodium Borohydride
Spent Fuels," *International Journal of Hydrogen Energy*, **35**,
2063-2072 (2010).

Diwan, M., Hwang, H.T., Al-Kukhun, A. and Varma, A.,
"Hydrogen Generation from Noncatalytic Hydrothermolysis
of Ammonia Borane for Vehicle Applications," *AIChE
Journal* (in press).

Hu, W., Knight, D., Lowry, B., and Varma, A., "Selective
Oxidation of Glycerol to Dihydroxyacetone over Pt-Bi/C
Catalyst: Optimization of Catalyst and Reaction Conditions,"
Industrial & Engineering Chemistry Research (in press).

Hwang, H. T., Al-Kukhun, A., and Varma, A., "Hydrogen for
Vehicle Applications from Hydrothermolysis of Ammonia
Borane: Hydrogen Yield, Thermal Characteristics, and
Ammonia Formation," *Industrial & Engineering Chemistry
Research* (in press).

Selected Conference Presentations

"Hydrogen for Vehicle Applications from Ammonia Borane:
Hydrogen Yield, Thermal Characteristics, and Ammonia
Formation," ISCRE-21 Meeting, Philadelphia, PA, June
(2010).

"Catalytic Oxidation of Glycerol, ISCRE-21 Meeting,
Philadelphia, PA, June (2010).

"Hydrogen Generation from Noncatalytic Hydrothermolysis
of Ammonia Borane for Vehicle Applications," NHA
Hydrogen Conference & Expo, Long Beach, CA, May (2010).

"Kinetics of Glycerol Selective Oxidation Over Pt-Bi/C
Catalyst," AIChE Annual Meeting, Nashville, TN, November
(2009).

"Method to Release Hydrogen from Ammonia Borane for
Portable Fuel Cell Applications," AIChE Annual Meeting,
Nashville, TN, November (2009).

"Selective Oxidation of Glycerol to High-Value Chemical
Dihydroxyacetone Over PtBi/C Catalyst," AIChE Annual
Meeting, Nashville, TN, November (2009).

"High Hydrogen Yield Ammonia Borane Hydrothermolysis
for Fuel Cell Based Vehicles," AIChE Annual Meeting,
Nashville, TN, November (2009).

Keynote: "New Methods to Generate Hydrogen from Boron
Compounds and Water," The 5th Sino-US Conference of
Chemical Engineering, Beijing, China, October (2009).

Keynote: "Evolving Trends in Chemical Engineering
Education," 8th World Congress of Chemical Engineering,
Montreal, Canada, August (2009).

"New Methods for Hydrogen Generation from Boron
Compounds and Water," 8th World Congress of Chemical
Engineering, Montreal, Canada, August (2009).



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

Editor, *Computers and Chemical Engineering*

Program Chair, Computing and Systems Technology (CAST)

Area 10E, Information Technology, 2010

Chair *Pharmaceutical Engineering in the 21st Century*,

Topical Symposium, 8th World Congress in Chemical Engineering, Montreal, Canada, Aug 2009

Selected Invited Lectures

"Abnormal Events Management in Complex Engineered Systems," University of California, Berkeley (EECS Department), February (2010).

"Drowning in Data: Modeling and Informatics Challenges and Opportunities in Molecular Products Design and Manufacturing," Danish Technical University, Denmark, October (2009).

"Drowning in Data: Modeling and Informatics Challenges and Opportunities in Molecular Products Design and Manufacturing," Bristol, Myers and Squibb, NJ, October (2009).

"Abnormal Events Management in Complex Engineered Systems," Swiss Federal Institute of Technology (ETH), Switzerland, September (2009).

Selected Publications

Venkatasubramanian, V., "Fairness Is an Emergent Self-Organized Property of the Free Market for Labor," *Entropy*, **12**(6) 1514 – 1531 (2010).

Patil, S., Srinivasa, S., Mukherjee, S., Rachakonda, A.R., and Venkatasubramanian, V., "Breeding Diameter Optimal Topologies for Distributed Indexes", **18**(2), *Complex Systems* (2009).

Pezzuto, J.M., Venkatasubramanian, V., Hamad, M. and Morris, K.R., "Unraveling the Relationship Between Grapes and Health," *J. Nutrition*, **139**(9), 1783S – 1787S (2009).

Hsu, S.-H., Stamatidis, S.D., Caruthers, J.M., Delgass, W.N., Venkatasubramanian, V., Blau, G.E., Lasinski, M. and Orcun, S., "Bayesian framework for building kinetic models of catalytic systems," *Ind. Eng. Chem. Res.*, **48** (10) 4768 – 4790, (2009).

Venkatasubramanian, V., "What is Fair Pay for Executives? An Information Theoretic Analysis of Wage Distributions," *Entropy*, **11**(4) 766 – 781 (2009).

Hsu, S.-H., Reklaitis, G.V., and Venkatasubramanian, V., "Modeling and Control of Roller Compaction for Pharmaceutical Manufacturing. Part I: Process Dynamics and Control Framework," *Journal of Pharmaceutical Innovation* (in press).

Hsu, S.-H., Reklaitis, G.V. and Venkatasubramanian, V., "Modeling and Control of Roller Compaction for Pharmaceutical Manufacturing. Part II: Control System Design," *Journal of Pharmaceutical Innovation* (in press).

Sesen, M.B., Suresh, P., Banares-Alcantara, R., and Venkatasubramanian, V., "An Ontological Framework for Automated Regulatory Compliance in Pharmaceutical Manufacturing," *Comp. Chem. Eng.* (in press).

Maurya, M.R., Paritosh, P.K., Rengaswamy, R. and Venkatasubramanian, V., "A Framework for On-Line Trend Analysis," *Engineering Applications of Artificial Intelligence*, (in press).

Hailemariam, L. and Venkatasubramanian, V., "Purdue Ontology for Pharmaceutical Engineering: Part I. Conceptual Framework," *Journal of Pharmaceutical Innovation*, (in press).

Suresh, P., Hsu, S.-H., Akkisetty, P., Reklaitis, G.V. and Venkatasubramanian, V., "Onto MODEL: Ontological Mathematical Modeling Knowledge Management in Pharmaceutical Product Development. 1: Conceptual Framework," *Ind. Eng. Chem. Res.* (in press).

Suresh, P., Hsu, S.-H., Akkisetty, P., Reklaitis, G.V. and Venkatasubramanian, V., "Onto MODEL: Ontological Mathematical Modeling Knowledge Management in Pharmaceutical Product Development. 2: Applications." *Ind. Eng. Chem. Res.* (in press).

Hamdan, I., Reklaitis, G.V., Venkatasubramanian, V., "Exceptional Events Management Applied to Roller Compaction of Pharmaceutical Powders," *Journal of Pharmaceutical Innovation* (in press).

Selected Conference Presentations

Villez, K., Srinivasan B., Rengaswamy, R., Narasimhan, S., and Venkatasubramanian, V., "Resilient control in view of valve stiction: Extension of a Kalman-based FTC Scheme," in the Proceedings of the 20th European Symposium on Computer Aided Process Engineering – ESCAPE-20, Ischia, Italy, June (2010).

Keynote Speaker, XI Chemical Engineering Congress, Tecnológico de Monterrey Chemical Engineering Student Society, Monterrey, Mexico, March (2010).

Keynote Speaker, 3rd Graz Pharmaceutical Congress, Graz, Austria, September (2009).

Keynote Speaker, International Conference on Process Systems Engineering, PSE'09, Salvador, Brazil, August (2009).



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

Scientific Committee, the 10th International Conference on Fundamentals of Adsorption (FOA-10), Japan May (2010)
Co-Chair (2008-2009) and Chair (2010-2011) of Area 2e Adsorption and Ion Exchange in the Separations Division, AIChE

Selected Publications

Kasat, R., Franses, E.I., and Wang, N.-H. L., "Experimental and Computational Studies of Enantioseparation of Structurally Similar Chiral Compounds on Amylose Tris (3,5-DimethylPhenylCarbamate)," *Chirality*, **22**, 565-579 (2010).

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).

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).

Chen, S., Adjianto, L., and Wang, N.-H. L., "In Vitro Folding of Methionine-Arginine Human Lyspro ProinsulinS-sulfonate-Disulfide formation Pathways and Factors Controlling Yield," *Biotechnology Progress* (in press).

Selected Conference Presentations

Invited presentation, Wang, N.H. L., "VERSE Rate Model Simulations and Applications in the Design of Batch and Continuous Chromatography Processes," Actinide Separations Conference, Argonne National Laboratory, Argonne, IL, May (2010).

Invited presentation, Chung, P.*, Chin, C., and Wang, N.-H. L., "Applications of VERSE Rate Model Simulations in the Design of Ion Exchange Processes," Actinide Separations Conference, Argonne National Laboratory, Argonne, IL, May (2010).

Bugayong, J. G. , Chin, C., Wang, N.-H. L., "Strategies to Increase Yield in Ternary Separation for Insulin Purification," Symposium on Advances in Bioseparations, AIChE Annual Meeting, Nashville, TN, November (2009).

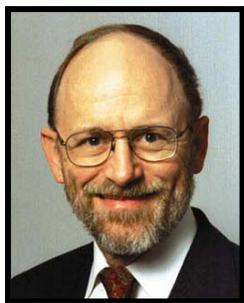
Chen, S.*, Adjianto, L., and Wang, N.-H. L., "In Vitro Folding of Methionine-Arginine Human Lyspro Proinsulin S-Sulfonate," Symposium on Advances in Protein Structure, AIChE Annual Meeting, Nashville, TN, November (2009).

Chung, P.*, Bugayong, J. G., Chin, C., Wang, N.-H. L., "A Comprehensive Rate Model for Predicting the Adsorption and Elution of Lispro Insulin in Reversed Phase Chromatography with Gradient Elution and Stepwise Elution," Symposium on Adsorption of Biomolecules, AIChE Annual Meeting, Nashville, TN, November (2009).

Wang, N.H. L., "Simulated Moving Bed Technologies for the Separations of Three or More Components and the Applications for the Production of High Purity Biochemicals and Biofuels," Plenary Session of the Separations Division: Separations, Energy, and Sustainability, AIChE Annual Meeting, Nashville, TN, November (2009).



Professor Wang (right) with Professor Franses (center) and Graduate Student Pei-Lun Chung



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

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

ChE Division, ASEE, Martin Best Paper Award, 2010

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, 2005-2009.
International Editorial Advisory Board of Journal of STEM Education, 2001 – present.
Contributing Editor, College Teaching, 2006-present.
Director AIChE Education Division, 2009-present.
Editorial board of Separation Science and Technology 1977–present.
Editorial Board of Adsorption, 1993–present.
Editorial board of Separation and Purification Reviews, 1998–present.
Chair of Workshop and Presenter, “Effective and Efficient Teaching for Prospective Faculty,” AIChE meeting, Nashville, TN, November 9, 2009, Session 40.
Co-Chair of Workshop and Presenter, “Fundamental Research in Education,” AIChE meeting, Nashville, TN, November 10, 2009, Session 206.

Selected Publications

Kostroski, K. and P.C. Wankat, “Hybrid Air Separation Processes for Production of Oxygen & Nitrogen,” *Separ. Sci. Technol.*, **45** (9), 1171-1185 (2010).

Lee, J.W. and P.C. Wankat, " Design of Pseudo-Simulated Moving Bed Processes with Multi-Objective Optimization for the Separation of Ternary Mixtures: Linear Isotherms," *J. Chromatography A*, **1217**, 3418-3426 (2010).

Lee, J.W. and P.C. Wankat, "Optimized Design of Recycle Chromatography to Isolate Intermediate Retained Solutes in Ternary Mixtures: Langmuir Isotherm Systems," *J. Chromatography A*, **1216**, 6946-6956 (2009).

Kim, J.-I., Wankat, P.C., Mun, S., and Koo, Y.-M., “Analysis of “Focusing” Effect in Four-Zone SMB (Simulated Moving Bed) Unit for Separation of Xylose and Glucose from Biomass Hydrolysate,” *J. Biosci. Bioeng.*, **108**, S65-S66 (2009).

Wankat, P.C., “Separations: A Short History and a Cloudy Crystal Ball,” *Chem. Engrg Educ.*, **43** (4), 286-295 (2009).

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

Selected Conference Presentations

Invited Panelist at Workshop “Work/Life Balance for New Engineering Educators,” ASEE meeting, Louisville, KY, June (2010).

Kostroski, K. and Wankat, P. C., “Hybrid Air Separation Processes for Production of Oxygen & Nitrogen,” AIChE Spring Meeting, San Antonio, TX, March (2010).

Lee, J.-W. and Wankat, P. C., “Multi-Objective Optimization Method to Design the Pseudo-SMB Process for the Separation of Ternary Mixtures,” AIChE Meeting, Nashville, TN, November (2009).

Sharma, P. K. and Wankat, P. C., “Solvent Recovery by Steam-less Adsorption Processes,” AIChE Meeting, Nashville, TN, November (2009).

Invited speaker in New Faculty Forum on “Tips for Busy New Professors,” AIChE Annual Meeting, Nashville, TN, November (2009).



Professor Wankat (left) with Provost Tim Sands



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

Selected Invited Lectures

“Block Copolymers for Tumor-Targeted Theragnostics”, Department Seminar, Department of Polymer Science and Engineering, University of Massachusetts, Amherst, MA, April (2010).

“Block Copolymer-Based siRNA Delivery for RNAi Cancer Therapy”, Department Seminar, Department of Chemical Engineering, Pohang University of Science and Technology (POTeCH), Pohang, Korea, June (2009).

“Block Copolymer-Based siRNA Delivery for RNAi Cancer Therapy”, Department Seminar, Department of Chemical and Biomolecular Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea, June (2009).

“Block Copolymer-Based siRNA Delivery for RNAi Cancer Therapy”, Department Seminar, Department of Chemical and Biological Engineering, Korea University, Seoul, Korea, June (2009).

“Fabrication of Functional Nano/Microstructures via Colloid and Block Copolymer Self-Assembly at Air-Water Interfaces”, Seminar, Active Polymer Center for Pattern Integration (APCPI), Yonsei University, Seoul, Korea, June (2009).

“Block Copolymer-Based siRNA Delivery for RNAi Cancer Therapy”, BK21 Seminar, School of Chemical and Biological Engineering, Seoul National University, Seoul, Korea, June (2009).

Selected Publications

Hur, J., Mahynski, N. A., Won, Y.-Y., “Crystallization of Bidisperse Repulsive Colloids in Two-Dimensional Space: A Study of Model Systems Constructed at the Air-Water Interface,” *Langmuir* **26** (14), 11737–11749 (2010).

Witte, K. N., Kewalramani, S., Kuzmenko, I., Sun, W., Fukuto, M., Won, Y.-Y., “Formation and Collapse of Single-Monomer-Thick Monolayers of Poly(n-Butyl Acrylate) at the Air-Water Interface,” *Macromolecules* **43** (6), 2990-3003 (2010).

Hur, J., Witte, K. N., Sun, W., 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* **26** (3), 2021-2034 (2010).

Kestur, U. S., Lee, H., Santiago, D., Rinaldi, C., Won, Y.-Y., Taylor, L. S., “Effects of the Molecular Weight and Concentration of Polymer Additives, and Temperature on the Melt Crystallization Kinetics of a Small Drug Molecule,” *Crystal Growth & Design* (in press).

Selected Conference Presentations

Won, Y.-Y., Witte, K. N., Sun, W., Kewalramani, S., Fukuto, M., Kuzmenko, I., “Formation and Collapse of Single-Monomer-Thick Monolayers of Poly(n-Butyl Acrylate) at the Air-Water Interface,” APS March Meeting, Portland, OR, March (2010).

K. N. Witte, W. Sun, S. Kewalramani, M. Fukuto, Y.-Y. Won, “Conformations of Polymers at the Air-Water Interface,” AIChE Annual Meeting, Nashville, TN, November (2009).

Gary, D. J., Won, Y.-Y., “Polymer-Based Delivery of siRNA for Cancer Treatment,” 7th International Nanomedicine and Drug Delivery Symposium (NanoDDS’09), Indianapolis, IN, October (2009).

Won, Y.-Y., Gary, D. J., Sharma, R., “DNA/siRNA Complexes with Block Copolymers: Effects of Polymer Architecture on the Physicochemical and Cell Interaction Properties of the Complexes,” (Invited talk at the Session titled “Hybrid Colloids, Interfaces, and Nanomaterials,” Division of Colloid & Surface Chemistry), ACS 238th National Meeting, Washington, DC, August (2009).



Professor Won and his research group



Yue Wu

Ph. D., Harvard, 2006

Assistant Professor

Air Force Summer Faculty Fellowship, 2010

DuPont Young Professor Award, 2010

Research Areas

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

Selected Professional Activities

Reviewer for Nano Letters, Journal of American Chemical Society, Journal of Physical Chemistry C, Environmental Science and Technology, IEEE Electronic Device Letters, Chemistry of Materials, Nanoscale Nano Research, ACS Petroleum Research Fund, National Science Foundation.

Selected Publications

Zhang, G., Wu, Y., "Performance Enhancement of Hybrid Solar Cells Through Chemical Vapor Annealing," *Nano Letters*, **10(5)**, 1628-1631 (2010).

Gautam, Y. G., Susoreny, J. A., Zhang, G., Yang, H., Wu, Y., "An Insight into the Feasibility and Sustainability of Large-scale Deployment for Thermoelectric Conversion," *Comments on Inorganic Chemistry* (submitted).

Selected Conference Presentations

Wu, Y., "Performance Enhancement of Nanocrystal-Conductive Polymer Hybrid Solar Cells Through Chemical Vapor Annealing", 2009 Material Research Society Fall Meeting, December (2009). (*Contribution talk*)

Intellectual Property

Y. Wu, "Performance Enhancement of Hybrid Solar Cells Through Chemical Vapor Annealing," US Provisional Patent, Application number 61/265,059.

Y. Wu, G. Zhang, "Ultrathin nanowire-based Thermoelectric Conversion," US Provisional Patent, Application number 61/327,192

Y. Wu, G. Zhang, "Nanoscale Heterostructures-based Thermoelectric Conversion," US Provisional Patent, Application number 61/327,199.

Y. Wu, G. Zhang, H. Yang, "Flexible Solar Cell Devices," US Provisional Patent, Application number 61/361,933.



Professor Wu (center) presenting information to a group of alumni



Chongli Yuan

Ph. D., Cornell, 2007

Assistant Professor

Research Areas

Biomimetic Nanoparticle Systems, Molecular Biophysics

Selected Professional Activities

AICHe 2010, Biosensor Session Co-chair

Panelist, NSF, Biomedical Engineering, May (2010)

Panelist, NSF, Biotechnology and Bioengineering, June (2010)

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 SnO₂ nano-cocoons with movable magnetic cores," *Advanced Materials*, **19**, 3328-3332 (2007).

Selected Conference Presentations

Jimenez-Useche, I., Yuan, C., The Effect of a DNA Methylation Pattern on the Nucleosome Array Self Assembly, AICHe annual meeting, Salt Lake City, November (2010) accepted.

Yuan, C., Self-Assembly of Gold Nanoparticles Guided by a Repetitive DNA Template, AICHe annual meeting, Salt Lake City, November (2010) accepted.



**Professor Yuan (left) with
Mary Ellen Weber, Outstanding Chemical Engineer 2009,
and Professor Varma**

Graduate Degrees Awarded

(July 1, 2009 to June 30, 2010)

M.S.	12
Ph.D.	18
Total	30

Ph. D. Degrees - August 2009

Boyle, Nanette
Stoichiometric Modeling of Photoautotrophic Metabolism, (Morgan), Postdoctoral Fellow, UCLA, CA

Diwan, Moiz
Hydrogen Generation for Fuel Cell Application, (Varma), Sr. Research Engineer, Abbott Laboratories, North Chicago, IL

Kelchner, Megan Farrell
Surface Forces Affecting the Biocompatibility of Modified Polydimethylsiloxane Films, (Beaudoin), Process Engineer, Intel, Phoenix, AZ

Joonhyung Lee
Development of Fluorescence and Radio Label-Free Detection Methods with Enhanced Sensitivity, (Savran/Won/Lee), R & D Engineer, Samsung Advanced Inst of Tech, Gyeonggi-do, South Korea

Nair, Hari
Fundamentals of Metal Oxide Catalysis, (Baertsch/Kim), R & D Engineer, ExxonMobil, Houston, TX

Pham, Bich Van
Characterization of Interaction Forces Between Bovine Serum Albumin and Self-Assembled Monolayers Relating to Protein Adhesion, (Beaudoin), R&D Engineer, Frito Lay, Plano, TX.

M.S. Degrees - August 2009

Pathare, Rugved
(Agrawal), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing for PhD

Sharma, Pradeep
(Wankat), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing for PhD

Ph.D. Degrees - December 2009

Gatt, Joseph E.
Development of Metal Oxide Catalysts for use in Target Specific Organic Compound (VOC) Gas Sensors, (Baertsch), Sr. Research Engr., ExxonMobil, Clinton, NJ

Guo, Qijie
Development of Multinary Chalcogenide Nanocrystal Inks for Low Cost Solar Cells, (Agrawal/Hillhouse), Postdoctoral Research Associate, Purdue University/ChE, West Lafayette, IN

Kilroy, Caitlin M.
Particle Adhesion with Microelectronics Applications, (Beaudoin), TD Process Engineer, Intel Corporation, Hillsboro, OR

Manz, Thomas A.
Quantitative Structure Activity Relationships for Olefin Polymerization Catalyzed by Ti and Zr Complexes with Mixed Cyclopentadienyl/Aryloxide Ligation, (Caruthers/Thomson), Research Scientist, Georgia Institute of Technology, Atlanta, GA

Novstrup, Krista A.
Development of Fundamental Kinetic Models of Single-Site Olefin Polymerization with a Focus on [rac-(C₂H₄(1-indenyl)₂)Zr(Me)]/[MeB(C₆F₅)₃] Catalyzed Polymerization of 1-Hexene, (Caruthers/Delgass), Senior Researcher, ExxonMobil, Annandale, NJ

Singh, Navneet R.
High Liquid Fuel Yielding Biofuel Processes and a Roadmap for the Future Transportation, (Agrawal/Ribeiro/Delgass), Process Engineer, Bayer Crop Science, Institute, WV

Smeltz, Andrew D.
Structure Activity Relationships in Catalysis Studied using Model Catalysts, (Ribeiro/Delgass), Postdoctoral Research Associate, Purdue University/ChE, West Lafayette, IN

Witte, Kevin
On the Structure and Thermodynamics of Polymer Brushes, (Won), Process Engineer, Intel, Rio Rancho, NM

M.S. Degrees - December 2009

Basu, Sumit
(Gore/Litster), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing for PhD

Gaik, Steven
Optimization of Double Gyroid Film Synthesis for use in Inorganic Bulk Heterojunction Photovoltaics, (Hillhouse/Agrawal), Continuing for PhD, Purdue University, West Lafayette, IN

Hamdan, Intan M.
(Reklaitis/Venkatasubramanian), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing for PhD

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

Park, Yoonjee
(Franses), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing for PhD

Pazmino, Jorge H.
(Delgass/Ribeiro), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing for PhD

Ramalingam, Santhosh K.
(Basaran), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing for PhD

Zhu, Qing
(Harris), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing for PhD

Ph.D. May 2010

Bhattacharya, Aparajita

Experimental Investigation and Constitutive Modeling of the Large Deformation Mechanical Behavior of Unfilled and Carbon Black Elastomers, (Caruthers/Venkatasubramanian)

Park, Yoonjee

Developing Aqueous Lipid Formulations with Low Surface Tension Behavior at Physiological Conditions and Stability against Aggregation, (Franses), Postdoctoral Research Associate, Boston University, Boston, MA

Sturtevant, Bryce D.

Computational Studies of Model Colloidal Dispersions, (Corti), Postdoctoral Research Associate, Purdue University, West Lafayette, IN

Werner, Sean R.

*Engineering *Saccharomyces cerevisiae* for Production of Non-Natural and Glycosylated Flavonoids*, (Morgan), Researcher, ExxonMobil, Paulsboro, NJ

M.S. Degrees – May 2010

O’Grady, John P.

*Effects of Substrates and Light on the Growth and Lipid Production of *Chlorella Protothecoides**, (Morgan), Purdue University, West Lafayette, IN, Continuing for PhD

Shukla, Aviral

Venkatasubramanian MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing for PhD



ChE Graduate Students

Graduate Student Enrollment - Fall 2009

	Last Name	First Name	Advisor(s)	UG Institution	Date Enrolled
1	Abbou Oucherif	Kaoutar	Litster	New Mexico Institute of Mining	Spring 2010
2	Al-Kukhun	Ahmad	Varma	Jordan University of Science & Tech	Fall 2008
3	Al-Musleh	Easa	Agrawal/Reklaitis	Quatar University	Fall 2008
4	Appathurai	Santosh	Basaran/Harris	Indian Institute of Tech, Madras	Fall 2007
5	Balachandran	Dave	Beaudoin	University of Wisconsin	Fall 2006
6	Bates	Shane	Baertsch	Pennsylvania State University	Fall 2008
7	Bhattacharya	Aparajita	Caruthers	UICT - Mumbai	Fall 2004
8	Chaugule	Saurabh	Delgass/Ribeiro	UICT - Mumbai	Fall 2006
9	Chen	Shuang	Wang	Zhejiang University	Fall 2005
10	Chen	Ye	Reklaitis/Pekny	Zhejiang University	Fall 2007
11	Choudhari	Harshavardhan	Agrawal/Delgass/ Ribeiro	University Institute of Chemical Tech	Fall 2009
12	Cipich (Chaffee)	Michelle	Beaudoin	Tri-State University	Fall 2006
13	Crouch	Zachary		Purdue University	Fall 2009
14	David	Anand	Caruthers/Pekny	U. of Minnesota, Twin Cities/Iowa St U.*	Fall 2009
15	Devaraj	Jayachandran	Ramkrishna	Natl U. of Singapore/Univ. of Madras*	Fall 2009
16	Dietrich	Paul	Ribeiro/Baertsch/ Delgass	University of Wisconsin/Madison	Fall 2009
17	Dong	Jiannan	Franses/Corti	Zhejiang University	Fall 2008
18	Emady	Heather	Litster/Wassgren	University of Arizona, Tuscon	Fall 2007
19	Fingland	Bradley	Delgass/Ribeiro	University of Missouri	Fall 2004
20	Ford	Grayson	Agrawal/Hillhouse	University of California, Santa Barbara	Fall 2006
21	Gaik	Steven	Agrawal/Hillhouse	Pennsylvania State University	Fall 2007
22	Galas	Richard	Liu	SUNY - Buffalo	Fall 2008
23	Gao	Danni	Varma	Tsinghua University	Fall 2009
24	Gao	Haijing	Basaran/Harris	Tsinghua University	Fall 2006
25	Gary	Dana	Won	Carnegie Mellon University	Fall 2005
26	Gatt	Joseph	Baertsch	University of Michigan	Fall 2004
27	Gawecki	Piotr	Agrawal/Delgass/ Ribeiro	University of California, Riverside	Fall 2008
28	Gharachorlou	Amir	Ribeiro	Amir Kabir University of Tech*	Spring 2010
29	Ghose	Ranjita	Varma	Univ. Inst. of Chem. Tech/U. of Florida*	Fall 2009
30	Guo	Qijie	Agrawal/Hillhouse	University of Rochester	Fall 2004
31	Hamdan	Intan	Reklaitis/ Venkatasubramania n	Purdue University	Fall 2006
32	Hamilton	Robert	Ramkrishna/Curtis	University of Missouri	Fall 1999
33	Hill	Cameron	Morgan	Montana State University	Fall 2009
34	Hirshfield	Laura	Reklaitis/ Venkatasubramanian	University of Michigan/Ann Arbor	Fall 2009

	Last Name	First Name	Advisor(s)	UG Institution	Date Enrolled
35	Hodge	Bri-Mathias	Reklaitis/Pekny	Carnegie Mellon U./Abo Akademi*	Fall 2006
36	Hu	Wenbin	Varma	Tsinghua University	Fall 2006
37	Huang	Shisheng	Agrawal/Pekny/ Reklaitis	National University of Singapore	Fall 2007
38	Huff	Joshua	Agrawal	Texas A & M University	Spring 2010
39	Jimenez-useche	Isabel	Yuan	University De Los Andes*	Fall 2009
40	Kadrmass	Clancy	Caruthers/Won	University of North Dakota	Fall 2007
41	Kadrmass	Julie	Liu	University of North Dakota	Fall 2007
42	Kar	Mahaprasad	Agrawal/Hillhouse	UIC-Mumbai	Fall 2005
43	Kilroy	Caitlin	Beaudoin	University of Notre Dame	Fall 2004
44	Kim	Dae Hwan	Won	Seoul National University	Fall 2007
45	Kim	Jaewoo	Caruthers	Seoul National University	Fall 2008
46	Kim	Yeji	Liu	Korea University	Fall 2009
47	Kispersky	Vincent	Delgass/Ribeiro	University of California, Santa Barbara	Fall 2007
48	Koswara	Andy	Chakrabarti	University of California, San Diego	Fall 2009
49	Lee	Eunwoong	Caruthers	Seoul National University	Fall 2006
50	Lee	Hoyoung	Won	Korea University	Spring 2009
51	Lee	Wen-Sheng	Delgass/Ribeiro	National Taiwan University	Fall 2007
52	Li	Jianfeng	Litster/Wassgren	Tsinghua University	Fall 2007
53	Ling	Lei	Wang	Tsinghua University	Fall 2009
54	Lim	Jung Sun	Harris	Kyung Hee University	Fall 2005
55	Luque	Maria Elisa	Reklaitis/ Venkatasubramanian	University of Buenos Aires	Fall 2008
56	Mallapragada	Dharik	Agrawal/Delgass/ Ribeiro	Indian Institute of Technology, Madras	Fall 2008
57	Manz	Thomas	Caruthers/Thomson	University of Toledo/Purdue University*	Fall 2003
58	Marimuthu	Kartikeyan	Chakrabarti	Anna University/IIT-Madras*	Fall 2009
59	McCarthy	Robert	Agrawal/Hillhouse	Washington University	Fall 2007
60	Mc Gough	Patrick	Basaran	Purdue University	Spring 2007
61	Mehta	Dhairya	Agrawal/Ribeiro/ Delgass	University Institute of Chemical Tech	Fall 2009
62	Novstrup	Krista	Caruthers/Delgass	University of Washington	Fall 2004
63	O'Grady	John	Morgan	Rose-Hulman Institute of Technology	Fall 2008
64	Ogebule	Oluwaseyi	Caruthers	Alabama Agricultural & ME U	Fall 2008
65	Oglesby	Patrick	Harris	Purdue University	Fall 2005
66	Park	Hye Yeon	Agrawal/Hillhouse	Korea University*	Fall 2009
67	Park	Yoonjee	Franses	Seoul National University	Fall 2006
68	Pathare	Rugved	Agrawal/Venkat	UIC - Mumbai	Fall 2005
69	Pazmino	Jorge	Delgass/Ribeiro	U. San Fran De Quito, Ecuador	Fall 2006
70	Pommer	Chris	Basaran/Harris	Purdue University	Fall 2007
71	Prabhu	Rasika	Caruthers	University of Bombay	Fall 2007
72	Ramalingam	Santhosh	Basaran	Indian Institute of Technology, Madras	Fall 2005
73	Sambath	Krishnaraj	Basaran	Indian Institute of Technology, Madras	Fall 2008
74	Sengupta	Neelanjan	Morgan	Indian Institute of Technology, Bombay	Fall 2006

	Last Name	First Name	Advisor(s)	UG Institution	Date Enrolled
75	Shah	Vishesh	Agrawal/Reklaitis	UICT - Mumbai	Fall 2006
76	Sharma	Pradeep	Wankat	Indian Institute of Technology, Madras	Fall 2006
77	Shekhar	Mayank	Delgass/Caruthers/ Ribeiro/Thomson	UICT - Mumbai	Fall 2008
78	Shenvi	Anirudh	Agrawal/Reklaitis/ Venkatasubramania n	UICT - Mumbai	Fall 2007
79	Shu	Che-Chi	Ramkrishna	National Taiwan University	Fall 2007
80	Shukla	Aviral	Venkatasubramania n/Morris	Indian Institute of Technology, Madras	Fall 2006
81	Singh	Meenesh	Ramkrishna	Sardel Patel University	Spring 2008
82	Singh	Navneet	Agrawal/Delgass/ Ribeiro	UICT - Mumbai	Fall 2005
83	Smeltz	Andrew	Delgass/Ribeiro	Ohio University	Fall 2004
84	Smith	Kathryn	Beaudoin	University of Wisconsin	Fall 2008
85	Soepriatna	Nicholas	Wankat	University of Texas, Austin	Spring 2010
86	Son	Sang Ha	Caruthers	Yonsei University	Fall 2007
87	Stamatis	Stephen	Caruthers/Delgass	University of Michigan	Fall 2005
88	Sturtevant	Bryce	Corti	North Carolina State University	Fall 2004
89	Su	Sheng-chuan	Liu	National Taiwan University	Fall 2009
90	Suchomel	Mark	Caruthers/Pekny	University of Minnesota, Duluth	Fall 2009
91	Sung	Pei-Fang	Harris	National Taiwan University	Fall 2006
92	Switzer	Jeffrey	Caruthers/Thomson	University of California, Davis	Fall 2006
93	Torabi	Korosh	Corti	Isfan University/IIT-Chicago*	Fall 2007
94	Tsui	Hung-Wei	Franses/Wang	National Taiwan University*	Fall 2009
95	Venkatakrishna n	Vinod	Agrawal/Delgass/ Ribeiro	Indian Institute of Technology, Madras	Fall 2009
96	Venkatesan	Anand	Wankat	Indian Institute of Technology, Madras	Fall 2008
97	Vora	Shaunak	Litster	UICT - Mumbai	Fall 2007
98	Walker	Bryce	Hillhouse/Agrawal	Brigham Young Universit	Fall 2009
99	Werner	Sean	Morgan	University of Illinois	Fall 2005
100	Williams	W. Damion	Delgass/Ribeiro	University of Oklahoma	Fall 2006
101	Witte	Kevin	Won/Kim	Ohio State University	Fall 2004
102	Xiong	Silei	Caruthers/Delgass/ Thomson	Tsinghua University	Fall 2009
103	Yadav	Gautam	Wu	University of Western Ontario	Fall 2009
104	Yang	Haoran	Wu	Tsinghua University	Spring 2010
105	Yohe	Sara	Agrawal/Delgass/ Ribeiro	University of Minnesota, Twin Cities	Fall 2008
106	Zarate	Nyah	Beaudoin/Litster	Illinois Institute of Technology, Chicago	Fall 2008
107	Zhang	Rong	Baertsch	Jilin University/Miami University*	Fall 2007
108	Zhu	Qing	Harris/Taylor	Zhejiang University	Fall 2006

*MS Institution

Facilities



Forney Hall of Chemical Engineering

In October 2004, the School of Chemical Engineering dedicated a 100,000 ft² 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 2011.

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.

Visiting Faculty

Dr. Parag Gogate

Lecturer in Chemical Engineering
at Institute of Chemical Technology
University of Mumbai

Dr. Enrico Martinez

Profesor, Instituto de Estudios Superiores de
Tamaulipas Altamira, Mexic

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 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;
- **Matt Tirrell**, Arnold and Barbara Silverman Professor in Departments of Bioengineering, Chemical Engineering and Materials Science & Engineering, University of California, Berkeley.

Industrial Advisory Council

The Chemical Engineering Industrial Advisory Council (IAC) was initiated in 1988 through the leadership support of senior executives from Abbott Laboratories, Air Products and Chemicals, Amoco, Dow Chemical and Quantum Chemical. Today the ChE IAC remains a partnership of leading corporations with the School of Chemical Engineering to advance and improve the education and professional preparation of chemical engineers who will meet the needs of industry in the 21st century.

The current IAC members are listed below.

3M

Abbott

Air Liquide

Air Products and Chemicals Inc.

Anheuser-Busch, Inc.

BP

ChevronPhillips Chemical

Dow Chemical Company

Du Pont

Eastman Chemical Company

Elanco Animal Health, a division of Eli Lilly

ExxonMobil Chemical Co.

Honeywell Process Solutions

Lubrizol Corporation

LyondellBasell

National Starch & Chemical Corp.

Pfizer Global

Procter & Gamble Co.

Roquette America Inc.

Shell Global Solutions (US) Inc.

UOP LLC

These corporations provide financial support for curriculum innovations, scholarships, experimental facilities enhancements, instructional computing facilities and start-up support for young faculty.

The Fall 2009 meeting took place on September 24, 2009 in Forney Hall, Purdue; the Spring 2010 meeting occurred February 12, 2010 in Naples, Florida.

Seminar Speakers - Fall 2009

September 8, 2009

Dr. James S. Nairne

Reese McGee Distinguished Professor
Department of Psychological Sciences
Purdue University

*“Adaptive Memory: How and Why
We Remember”*

September 15, 2009

Dr. Darsh Wasan

Motorola Chair Professor in Chemical Engineering
& Vice President
Illinois Institute of Technology

“New Vistas in Dispersion Science and Engineering”

September 29, 2009

Dr. Antony Beris

Arthur B. Metzner Professor of
Chemical Engineering
University of Delaware

*“Polymer-modified Turbulence: Large
and Small Scale Analysis”*

October 6, 2009

Dr. Peter A. Monson

Professor of Chemical Engineering,
Adjunct Professor of Chemistry
University of Massachusetts

*“Molecular Modeling of the Thermodynamics and
Dynamics of Adsorption in Mesoporous Materials”*

October 15, 2009

Dr. Lorenz T. Biegler

Bayer Professor of Chemical Engineering,
Carnegie Mellon University

*“Algorithmic Advances and Applications for
Chemical Process Optimization”*

October 20, 2009

Dr. Timothy Anderson

Associate Dean for Research & Graduate Programs/
Distinguished Professor of Chemical Engineering
University of Florida

*“Light In and Light Out: Solid-state Lighting and
Thin Film Photovoltaics”*

November 3, 2009

Dr. Paula T. Hammond

Bayer Professor & Executive Officer
Department of Chemical Engineering
Massachusetts Institute of Technology

*“Self-Assembly Approaches toward Directed Drug
Delivery: from Patchy Micelles to MAD Nanolayers”*

November 17, 2009

Dr. Liang-Shih Fan

Distinguished University Professor and C. John
Easton Professor in Engineering
The Ohio State University

“Chemical Looping Technology”

December 1, 2009

Dr. Alexander Couzis

Herbert G. Hayser Professor and Chairman
Chemical Engineering Department
City College of New York

*“Spatially Addressable Biosensor Arrays Based on
Liposome Self-Assembly
Into Microwells”*

December 8, 2009

Dr. Enrico Martinez

Visiting Professor
Instituto de Estudios Superiores de
Tamaulipas Altamira, Mexico

*“Anionically Polymerized Elastomers: Synthesis,
Structure and Applications –
State of the Art”*

Seminar Speakers – Spring 2010

January 26

Dr. Christopher Bowman
Patten Professor of
Chemical & Biological Engineering
Associate Dean for Research
University of Colorado-Boulder
*“Photochemically and Thermally Triggered Covalent
Adaptable Polymer Networks”*

February 9, 2010

Dr. Richard Register
Professor and Chair of the Chemical
Engineering Department
Princeton University
*“Shear Alignment of Block Copolymer Films and
their Applications in Nanopatterning”*

February 16

Dr. David Green
Assistant Professor of Chemical Engineering
University of Virginia
*“Controlling Nanoparticle Dispersion in Polymer
Melts”*

February 23, 2010

Dr. Brian A. Korgel
Matthew Van Winkle Regents Professor
of Chemical Engineering
University of Texas at Austin
*“Semiconductor Nanowires and Nanocrystals for
Transistor and Photovoltaic Applications”*

March 2, 2010

Dr. D. Bhattacharyya
University Alumni Professor
Department of Chemical and Materials Engineering
University of Kentucky
*“Functionalized Membranes for
Separations and Reactions”*

March 9, 2010

Dr. Abhaya K. Datye
Distinguished Regents Professor of Chemical
& Nuclear Engineering,
University of New Mexico
*“Steam Reforming of Methanol for
Portable Power”*

March 23, 2010

Dr. Parag Gogate
Lecturer in Chemical Engineering
at Institute of Chemical Technology
University of Mumbai
*“Process Intensification/Improvement using
Cavitation Reactors”*

Kelly Lectures

Dr. Rakesh Jain
Andrew Werk Cook Professor of
Tumor Biology,
Harvard Medical School
Director, Edwin L Steele Laboratory for Tumor
Biology, Massachusetts General Hospital

March 30, 2010 @ 3:30-4:30 p.m.

*“Normalizing Tumor Vasculature to Treat Cancer:
From Mathematical Model to Mouse to Man”*

March 31, 2010 @ 9:30 a.m.-10:30 p.m.

*“Delivery of Molecular and Nano Medicine in
Tumors”*

April 6, 2010

GSO Seminar

Dr. Chau-Chyun Chen
Vice President of Technology
Aspen Technology
*“Process Modeling for the Changing World: From
CO₂ Capture to
Drug Molecule Solubility”*

April 13, 2010

Dr. William J. Koros
Roberto C. Goizueta Chair for Excellence
in Chemical Engineering & GRA Eminent
Scholar in Membranes
Georgia Tech
*“Alternatives to Large Scale Thermally-Driven
Separation Processes: Realistic Paths Around
Difficult Hurdles?”*

April 20, 2010

Dr. Gregory B. McKenna
Horn Professor, Dept. of Chemical Engineering
Texas Tech University
*“Using Mechanics to Probe the Behavior of Glassy
Materials: Equilibrium and Non-equilibrium
Behaviors”*

April 27, 2010

Dr. Michael P. Thien
Senior Vice President, Global Science,
Technology & Commercialization
Merck Manufacturing Division,
Merck & Company, Inc.
*“Engineering Contributions to Fighting AIDS: A
Small Tale in a Big Story”*