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Purdue University
School of Chemical Engineering

Message from the Head

Purdue University and the School of Chemical Engineering had another exciting year!

In July 2007, Purdue welcomed Dr. France A. Cordova as the 11th President of the University, founded in 1869. Dr. Cordova, an internationally recognized astrophysicist and experienced administrator, came to Purdue from the University of California-Riverside, where she was Chancellor since 2002. During the past year, several working groups along with many participating students, staff and faculty, have created the University's next strategic plan (2009-14) titled “New Synergies” that was approved by Purdue's Board of Trustees in June 2008. The strategic plan has three overall goals: launching tomorrow's leaders, promoting discovery with delivery, and meeting global challenges. At the core of the Plan is the maximization of synergies between disciplines for solving current and future world needs. The College of Engineering and the School of Chemical Engineering will play key roles in delivering on the University’s Plan.

In the College of Engineering, the new $53 million engineering administration building, Neil Armstrong Hall of Engineering, was dedicated in October 2007, and the School of Chemical Engineering continued to flourish in our expanded Forney Hall. The $20-m illion Addition, dedicated in October 2004, is buzzing with activity, and the older building is undergoing a $13 million renovation in phases, with the latest one starting this week! On another important note, our BS degree program received the full six-year ABET accreditation earlier this year.

This year, we welcomed faculty members Jim Litster and Julie Liu. Dr. Litster has primary appointment in Chemical Engineering and a secondary one in Industrial and Physical Pharmacy. He joined us in August 2007, coming from the University of Queenslan d, Australia, where was Professor of Chemical Engineering and Head, School of Engineering. Jim’s research interests are in particle design and formulation, granulation and agglomeration, and crystallization of bioactives. He brings these strengths to our NSF Engineering Research Center on Structured Organic Composites. Dr. Liu joined us in January 2008, with research interests in engineering biomimetic materials that direct specific cellular response, and complement existing medical engineering research in the School. During the past year, the faculty received numerous recognitions, which are described in this report.

During this Centennial year of AIChE, several recognitions have come to Purdue faculty members, past and present, and alumni. Dr. Henry Rushton (Purdue ChE faculty member, 1955-71; AIChE President 1957) has been named one of the “50 Eminent Chemical Engineers of the Foundation Age;” 3 out of 30 “Groundbreaking ChE Books” were written by authors while they were on the Purdue ChE faculty: D.R. Coughanowr and L.B. Koppell, “Process Systems Analysis and Control”; J.M. Smith and H.C. van Ness, “Chemical Engineering Thermodynamics”; and R. Norris Shreve, “Chemical Process Industries.” As an astronaut, Dr. Mary Ellen Weber (BS ’84) is listed among the nine “Chemical Engineers in Space”; Henry T. Sampson(BS ’56), co-inventor of gamma-electric cell technology used in cell phones is listed among the “Twenty Chemical Engineers in Other Pursuits”; Paul Oreffice (BS ’49; former CEO, Dow Chemical Co.) is among the top “25 Industrial Executives”; and faculty member Sangtae Kim is listed among the “100 Chemical Engineers of the Modern Era,” along with former faculty member Nicholas A. Peppas.
(1976-2002), and School alumni Kristi Anseth (BS ‘92), Mike Ladisch (MS ’74, PhD ’77) and Vern Weekman (BS ‘53, PhD ’63).

In our 2007-2008 Professional Activity Report, you will read how the School has continued field-defining research in key areas – from nanostructured materials to future energy sources. Our mix of young faculty augmenting seasoned researchers fosters unparalleled collaboration, creativity and innovation. The faculty members remain active in professional societies, journal and book series editorships, and serve on academic, industrial and government advisory boards. They serve at all levels of professional and national responsibility, and are in great demand as lecturers around the globe. Our faculty members provide expertise and solutions to grand challenge problems that the world faces today – whether in energy, nanotechnology, biotechnology, healthcare or advanced materials.

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

Sincerely,

Arvind Varma
R. Games Slayter Distinguished Professor
Head, School of Chemical Engineering
**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** – Corti, Harris, Thomson, Won

**Polymers and Materials** – Caruthers, Hillhouse, Litster, Pipes, Varma, Won

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

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

**Energy** – Agrawal, Baertsch, Caruthers, Delgass, Hillhouse, Ho, Morgan, Pekny, Ribeiro, Varma

**Medical Engineering** – Caruthers, Franses, Liu, Morgan, Pekny, Pipes, Ramkrishna, Won

**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
National Academy of Engineering
Chemical Weekly’s Padmashri Dr. G. P. Kane CHEMCON Distinguished Speaker Award, IChemE (2007)
Industrial Research Institute Achievement Award (2007)

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

Selected Professional Activities
Consulting Editor, Separations, AIChE Journal
Member, NRC Board on Energy and Environmental Sciences
Member, AIChE Board of Directors
Member, AIChE Energy Commission
Member, NRC Committee on Assessment of Resource Needs for Fuel Cell and Hydrogen Technologies
Member, AIChE Fellow Review Committee
Member, National Academies Panel for the Committee on America’s Energy Future
Member, AIChE International Committee
Member, Technical Advisory Council, FOCAPO
Member, Technical Advisory Board: Dow Chemical Co., Kyroren Ltd.
Consultant: Air Products & Chemicals, Exxon Mobil Research and Engineering Co.

Selected Invited Lectures


Selected Publications


Selected Conference Presentations


Chelsey D. Baertsch  
Ph. D. University of California at Berkeley, 2001  
Assistant Professor  
NSF Career Award (2007)

Research Areas  
Heterogeneous catalysis, microchemical systems, MEMS, micro gas sensors and materials, high-throughput operando catalyst characterization, complex oxide nanostructures, natural gas conversion and H$_2$ production

Selected Professional Activities  
Chair, AIChE Annual Meeting, Two Sessions: 1) In-situ and Operando Spectroscopy of Catalysts, 2) Industrial, Catalytic, and Environmental Gas Sensors, Salt Lake City, UT, November (2007)  

Selected Publications  

Selected Conference Presentations  
Osman Basaran
Ph. D. University of Minnesota, 1984
Reilly Professor of Fluid Mechanics
Director of Graduate Studies

Research Areas
Fluid Mechanics, Rheology, Drop Dynamics, Interfacial Phenomena, Finite Element
Computational Analysis, Ink-Jet Printing, MEMS, Electroseparations

Selected Invited Lectures
“Exploiting Singularities and Instabilities to Produce Micro-scale Drops and Features,” Chemical Engineering Department, Lehigh University, Bethlehem, PA, April (2007), Mechanical Engineering Graduate Seminar, Purdue University, West Lafayette, IN, September (2007).


Selected Publications


Selected Conference Presentations


Stephen P. Beaudoin  
Ph. D. North Carolina State University, 1995

Professor  
Director of Undergraduate Studies

Purdue University Faculty Scholar (2006-2011)

Research Areas  
Particle and Thin Film Adhesion, Electronic Materials, Chemical Mechanical Polishing, Biosensors

Selected Professional Activities
Chair, Particle Division of Adhesion Society  
Member, Purdue University Provost’s Diversity Leadership Group

Selected Invited Lectures
“Particle Adhesion over Multiple Length Scales,” Lindsay Lecture Series, Texas A&M University Department of Chemical Engineering, November (2007).

Selected Publications


Selected Conference Presentations


James M. Caruthers  
Sc. D. Massachusetts Institute of Technology, 1977

Professor

Purdue Faculty Fellowship in a Second Discipline

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


David S. Corti  
Ph. D. Princeton University, 1997  
Associate Professor  

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

Selected Professional Activities  
Member, Area 1a Programming Committee, AIChE  
Session chair, “Thermodynamics and Phase Behavior I,”  
AIChE Annual Meeting, Salt Lake City, UT, November (2007)  
Session chair, “Thermodynamics and Phase Behavior IV,”  
AIChE Annual Meeting, Salt Lake City, UT, November (2007)  

Selected Publications  

Selected Conference Presentations  
W. Nicholas Delgass  
Ph. D. Stanford, 1969

Maxine Spencer Nichols Professor (2007)  
Shreve Teaching Award, School of Chemical Engineering (2007)

Research Areas  
Heterogeneous catalysis, catalyst design by Discovery Informatics, olefin polymerization, alkane aromatization, water gas shift reaction, propylene epoxidation over Au nanoparticles, spectroscopy of surfaces

Selected Professional Activities
Director, Catalysis and Reaction Engineering Division, AIChE  
Editorial Board, Journal of Catalysis

Selected Invited Lectures
"Catalyst Design," Seminar, Department of Chemical Engineering, University of California Santa Barbara, May (2008).

Selected Publications


Selected Conference Presentations


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


Robert E. Hannemann
M.D. Indiana University, 1959

Visiting Professor

Research Areas

Selected Publications


Selected Conference Presentations

Michael T. Harris  
Ph. D. University of Tennessee – Knoxville, 1992  

Professor and  
Associate Dean of Undergraduate Education  
Purdue University Faculty Scholar (2004-2008)  

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

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

Selected Publications  

Selected Conference Presentations  
Hugh W. Hillhouse  
Ph. D. University of Massachusetts, 2000  
Associate Professor  

Frontiers of Engineering Program (2007)  
Early Career Research Award, College of Engineering, Purdue University (2008)  

Research Areas  
Solar Energy Conversion, Nanomaterials, Colloidal & Interfacial Phenomena

Selected Professional Activities  
Session Chair, “Nanostructured Thin Films” AIChE Annual Meeting, Salt Lake City UT, November (2007).  

Selected Invited Lectures  
Seminar, School of Engineering and Electronics, University of Edinburgh, Scotland, March, (2008).  
Departmental Seminar, Chemical Engineering, University of Delaware, February (2008).  


“Nanocrystal and Nanowire Solar Cells,” Departmental Seminar, School of Materials Engineering, Purdue University, West Lafayette, IN, November (2007).  

Selected Publications  


Selected Conference Presentations  


Nancy W. Y. Ho  
Ph. D. Purdue University, Molecular Biology

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

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

R. Neal Houze  
Ph. D. University of Houston, 1968

Professor  
Shreve Teaching Award, School of Chemical Engineering (2008)

Selected Professional Activities  
Teaching Academy Committee for the Education of Teaching Assistants  
University Committee on Superior Students  
University Cooperative Education Coordinating Committee  
Teaching Academy  
Faculty Advisor for Mortar Board  
Mediator for College of Engineering  
Faculty Affiliate with Center for Instructional Excellence  
Engineering ABET Committee

Sangtae Kim  
Ph. D. Princeton, 1983

Donald W. Fedderson Distinguished Professor  
National Academy of Engineering  
AIChE George Lappin Award (2008)

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)  
Panel on Simulation Based Engineering & Science  
Member, Awards Committee, AIChE  
Advisory Boards (academic)  
Dept. of Chemical Engineering, University of Arizona  
Dept. of Chemical Engineering, University of California Santa Barbara  
College of Engineering, Illinois Institute of Technology  
Dept. of Chemical Engineering, Tenn. Tech. University.  
Center for Advanced Diagnostics and Therapeutics, University of Notre Dame

Selected Invited Lectures  
Department Colloquia presented at: LSU, Center for Computation and Technology (2008); UIUC Fluid Mechanics Seminar Series, March (2008)  
Inaugural Lecturer, University of Massachusetts, Dept. of Chemical Engineering newly endowed (to be named) lectureship, October (2007).  
Invited panelist, Third International Conference on e-Social Science, Ann Arbor, MI, October (2007).
James D. Litster  
Ph. D. University of Queensland, 1985

Professor of Chemical Engineering  
Professor of Industrial and Physical Pharmacy  
Honorary Visiting Professor, University of Queensland (2007)

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

Selected Professional Activities  
Member, Solae LLC (St Louis) Scientific Advisory Board  
Member, Board of the Co-operative Research Centre for Rail  
Member, NSF review panel on Particulate and Multiphase Processes (2007)  
Consultant, International Fine Particle Research Institute  
Chair, Mining Education Australia Board  

Selected Invited Lectures  
“Granulation Rate Processes,” Johnson and Johnson Inc. PA, October (2007).

Selected Publications  


Selected Conference Presentations  


Julie C. Liu  
Ph. D. Caltech, 2006  
Assistant Professor  
National Institutes of Health Postdoctoral Fellowship (2007)  
Research Areas  
Biomaterials, Tissue Engineering, Protein Engineering  

Selected Publications  

Selected Conference Presentations  

John A. Morgan  
Ph. D. Rice, 1999  
Associate Professor  
Research Areas  
Metabolic Engineering, Biocatalysis  

Selected Professional Activities  
Chair, Advances in Metabolic Engineering, AIChE National Meeting, Salt Lake City, UT, November (2007)  
Associate Editor, Bioprocess and Biosystems Engineering  

Selected Invited Lectures  

Selected Publications  

Selected Conference Presentations  
Joseph F. Pekny  
Ph. D. Carnegie Mellon University, 1989  

Professor  
Interim Head, School of Industrial Engineering  
Director, e-Enterprise Center at Discovery Park  
Founding Director, Regenstrief Center for Healthcare 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  
Co-Founder of the National Healthcare Engineering Alliance  

Selected Publications  

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

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

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

Selected Professional Activities  
Fellow, American Society of Mechanical Engineers  
Fellow, Society for Advanced Materials and Process Engineering  
Member, NRC Committee Panel on Building and Fire Research  

Selected Publications  
Selected Professional Activities
Fellow, AIChE

Selected Invited Lectures

“The Road Ahead.” Talk to MSc. students about opportunities ahead, Ramnarain Ruia College, Mumbai, India, December (2007).


Selected Publications


Selected Conference Presentations


Gintatas V. “Rex” Reklaitis
Ph. D. Stanford University, 1969
Edward W. Comings Distinguished Professor
National Academy of Engineering

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

Selected Invited Lectures


Selected Publications


Selected Conference Presentations


Fabio H. Ribeiro  
Ph. D. Stanford University, 1989  
Professor  
Purdue University Faculty Scholar (2006 – 2011)  
Research Areas  
Surface Science and Kinetics of Heterogenous Catalytic Reactions

Selected Professional Activities  
Editorial Board, Catalysis Letters  
2nd Vice Chair, Catalysis and Reacton Engineering, Division, AIChe  
Proposal Review Committee Member, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory

Selected Publications  

Selected Conference Presentations  


Kendall T. Thomson  
Ph. D. University of Minnesota, 1999  
Associate Professor  
Purdue University Faculty Scholar (2008-2013)  
Research Areas  
Computational Catalysis Design, Computer-Aided Design of Nanoporous Materials, Ab Initio Molecular Dynamics, Molecular Electronics, Modeling Nano- and Mesoporous Materials

Selected Professional Activities  
Session Chair, “Computational Catalysis II,” AIChe Annual Meeting, Salt Lake City, UT, November (2007).  
Session Chair, “First-Principles Simulations of Condensed Phases,” AIChe Annual Meeting, Salt Lake City, UT, November (2007).

Selected Publications  
Arvind Varma  
Ph. D. Minnesota, 1972  

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

Golden Jubilee Visiting Fellow, UICT-Mumbai (March 2008)  

Research Areas  
Chemical and Catalytic Reaction Engineering, Clean Energy Sources,  
Synthesis of Advanced Materials  

Selected Professional Activities  
Series Editor, *Cambridge Series in Chemical Engineering*,  
Cambridge University Press  
Member, ISCRE Board  
Chair, Diversity Award Committee, Council for Chemical Research, 2008  
Member, GCEP Proposal Review Panel,  
Stanford University, May 2008  

Selected Invited Lectures  
Reliance Industries Ltd, Mumbai, India, March (2008)  
New Jersey Institute of Technology, Newark, NJ, March (2008)  
University of Pittsburgh, Pittsburgh, PA, September (2007)  
Carnegie-Mellon University, Pittsburgh, PA, September (2007)  

Selected Publications  
Shafirovich, E., Teoh, S. K. and Varma, A., “Combustion of  
Levitated Titanium Particles in Air,” *Combustion and Flame*,  

Diwan, M., Diakov, V., Shafirovich, E. and Varma, A.,  
“Noncatalytic Hydrothermolysis of Ammonia Borane,”  
(2008).  

Wave Front Propagation for Transition Metal/Alloy/Cermet  

Diakov, V., Diwan, M., Shafirovich, E. and Varma, A.  
“Mechanistic Studies of Combustion Stimulated Generation of  
Hydrogen from Sodium Borohydride,” *Chemical Engineering  

Andrzejak, T., Shafirovich, E., Taylor, D. and Varma, A.,  
“Apparatus for Studies of High-Temperature Chemical  
Reactions in Single Particle Systems,” *Review of Scientific  
Instruments*, 78 (8), art. 085102, 7 pages (2007).  

Oxygen Carriers for Chemical Looping Combustion,”  

Erri, P. and Varma, A., “Spinel-Supported Oxygen Carriers  
for Inherent CO2 Separation during Power Generation,”  
*Industrial & Engineering Chemistry Research*, 46, 8597-8601  
(2007).  

Selected Conference Presentations  
“Catalytic Conversion of Glycerol to High-Value Chemicals”,  
Biofuels Symposium, Discovery Park Energy Center, Purdue  
University, West Lafayette, IN, May (2008).  

“Increasing Productivity of Bioethanol. A Model-Driven  
Approach to Process Optimization and Strain Improvement”  
Biofuels Symposium, Discovery Park Energy Center, Purdue  
University, West Lafayette, IN, May (2008).  

“Transition Metal / Alloy Foams By Combustion Technique,”  
AIChE Annual Meeting, Salt Lake City, UT, November  
(2007).  

“Modeling of Combustion Wave Propagation in  
Heterogeneous Mixtures for Hydrogen Generation,” AIChE  
Annual Meeting, Salt Lake City, UT, November (2007).  

“Heterogeneous Mixtures of Boron Compounds with Metals  
and Water for Hydrogen Generation,” AIChE Annual  
Meeting, Salt Lake City, UT, November (2007).  

“Hydrogen Generation for Portable Fuel Cells by Using Novel  
Chemical Mixtures,” 234th ACS National Meeting, Boston,  
MA, August (2007).  

“Ignition of Aluminum Particles Coated by Nickel or Iron:  
Studies under Normal and Reduced Gravity Conditions,” 43rd  
AIAA/ASME/SAE/ASEE Joint Propulsion Conference,  
Cincinnati, OH, July (2007).  

“Metal-CO2 Propulsion for Mars Missions: Current Status and  
Opportunities,” 43rd AIAA/ASME/SAE/ASEE Joint  
Venkat Venkatasubramanian
Ph. D. Cornell, 1984

Professor
Professor of Industrial and Physical Pharmacy (Courtesy)
Honorary Visiting Professor, Indian Institute of Information Technology (IIIT-B), Bangalore, India

Fellow of the Teaching Academy, Purdue University
Best Paper Prize, Computers and Chemical Engineering (2008)

Research Areas

Selected Professional Activities
Editorial Board, Computers and Chemical Engineering
Guest Editor, Computers and Chemical Engineering, Prof. Rex Reklaitis 65th Birthday Special Issue (2008)

Selected Invited Lectures
Drinking from a Fire Hose: Modeling and Informatics Challenges and Opportunities in Product Design, University of Texas at Austin, October (2007), Virginia Polytechnic Institute, October (2007), Texas Tech University, February (2008).

Keynote Speaker, European Congress of Chemical Engineering ECCE-6, Copenhagen, Denmark, September (2007).


Selected Publications


Selected Conference Presentations
Nien-Hwa Linda Wang
Ph. D. Minnesota, 1978
Professor

Violet Hass Award, Purdue University (2008)

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

Selected Professional Activities
Chair, Bioseparations in the Separations Division, AIChE (2006-2007)
Vice-Chair, Adsorption and Ion Exchange in the Separations Division, AIChE
Member, AIChE Separations Division Networking Committee

Selected Invited Lectures
“Simulated Moving Bed Technologies for Producing High Purity Insulin,” Dept. of Chemical Engineering, National Taiwan University, Taipei, Taiwan, December (2007).
“Simulated Moving Bed Technologies for Producing High Purity Biochemicals and Pharmaceuticals,” Dept. of Chemical Engineering, Ohio State University, Columbus, OH, October (2007).

Selected Publications

Selected Conference Presentations
Phillip C. Wankat
Ph. D. Princeton University, 1970

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

Research Areas
Adsorption Operations, Large-Scale Chromatography, Distillation, Engineering Education

Selected Professional Activities
Editorial Board, Separation Science and Technology
Editorial Board, Adsorption
Editorial Board, Separation and Purification Reviews
Associate Editor, Chemical Engineering Education
Associate Editor, Annuals of Research in Engineering Education
International Editorial Advisory Board, Journal of STEM Education
Contributing Editor, College Teaching
ASEE: Fellows Selection Committee, 2005-2007
Co-chair & presenter, Career Development Workshop for New Faculty, ASEE ChED Summer School, Pullman, WA, August (2007)
Co-chair & presenter in Active Learning Techniques Workshop, AIChE Annual Meeting, Salt Lake City, UT, November (2007)
Co-chair of session on Computing and Simulation in ChE Curriculum, AIChE Annual Meeting, Salt Lake City, UT, November (2007)
Co-Chair, “PSA/TSA/LSA Simulations,” AIChE Annual Meeting, Salt Lake City, UT, November (2007)

Selected Invited Lectures
“Reducing Distillation Column Diameters with Applications to Ethanol Biorefineries,” Mississippi State University, Starkville, MS, October (2007).

Selected Publications


Selected Conference Presentations


You-Yeon Won
Ph. D. Minnesota, 2000

Assistant Professor
Assistant Professor of Materials Science Engineering (by courtesy)

3M Nontenured Faculty Grant Award
KIChe-US Outstanding Young Investigator Award (2007)

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
Vice-Chair, Nanoscale Structure in Polymers II: Nanostructured Polymeric Material, AIChE Annual Meeting, Salt Lake City, UT, November (2007)

Selected Invited Lectures
“Triblock Copolymer Micelle-Based DNA/siRNA Delivery,” Departmental Seminar, Department of Chemical and Biomolecular Engineering, University of Maryland, College Park, MD, April (2008), Department of Chemical Engineering and Materials Science, Michigan State University, East Lansing, MI, February (2008), Department of Chemistry, University of Memphis, Memphis, TN, November (2007), Department of Pharmaceutics and Pharmaceutical Chemistry, University of Utah, Salt Lake City, UT, November (2007).


Selected Publications


Selected Conference Presentations


Witte, K. N. and Won, Y.-Y., “Mixed Polyelectrolyte and Neutral Polymer Brushes: Macroscopic or Microscopic Phase Separation,” AIChE Annual Meeting, Salt Lake City, UT, November (2007).


Graduate Degrees Awarded

(September 1, 2007 to August 31, 2008)

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<th>M. S.</th>
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<td>Ph. D.</td>
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<td>26</td>
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M. S. Degrees

August 2007

1. Rebecca A. Martin
   *Investigation of the Linear and Nonlinear Viscoelastic Behavior of Polymethylmethacrylate*, (Caruthers), EG&G Technical Services, Crane Naval Service Center, Crane, IN - Elastomer Engineer

December 2007

2. Chen, Shuang
   *A Study of the Folding of Methionine-Argine Human Proinsulin S-Sulfonate*, (Wang), Purdue University, West Lafayette, IN – Continuing for PhD

3. Paul D. Hobson
   *Ab Initio Studies of the Properties of Carbon Nanotubes and Silicon Nanowires*, (Thomson), Chevron Phillips Chemical Co., Houston, TX – R & T Process Development Engineer

May 2008

4. C. Rocio Misiego Arpa

Ph. D. Degrees

August 2007

1. Ankur Jain
   *An Ontological Framework for Knowledge Modeling and Decision Support for Pharmaceutical Product Development*, (Reklaitis/Venkatasubramanian), United Airlines, Elk Grove Village, IL – Senior Analyst

2. Sridhar V.V.S. Maddipati
   *Advanced Computational and Machine Learning Tools in Pharmaceutical Informatics*, (Kim/Venkatasubramanian), Fair Isaac, San Diego, CA – Analytic Scientist

3. Ravi K. Nandigam
   *Advanced Informatics Based Approaches for Data Driven Drug Discovery*, (Kim), Aspen Technology, Cambridge, MA – Senior Software Developer R & D

4. Elizabeth S. Royston
   *Assembling Inorganic Nanomaterials using Tobacco Mosaic Virus Templates*, (Harris), University of Maryland – Research Associate

5. Daniel W. Siderius
   *Statistical Geometric Models of Hard-Sphere Colloidal Dispersions: Application to Interfacial Thermodynamics and the Calculations of Depletion Forces*, (Corti), Washington University, St. Louis, MO – Postdoc

6. Ervina Widjaja
   *Deposition of Colloidal Particles During Sessile Drop Evaporation*, (Harris), Antares Offshore, L.L.C., Houston, TX – Project Engineer

7. Hak Koon Yeoh
   *Instabilities and Pattern Formation Under an Applied Non-Uniform Electric Field*, (Basaran), University of Malaya, Kuala Lumpur, Malaysia – Senior Lecturer

8. Luis Zalamea
   *On the Cohesion of Carbon Nanotubes in Nanostructures*, (Pipes), Dow Europe GmbH, Frinbach, Switzerland – R & D Engineer
9. Timothy Andrzejak  
*Experimental Studies on the Ignition of Single Ni/Al, Fe/Al, and Ti Particles*, (Varma), Schlumberger, Rosharon, TX – R & D Engineer

10. Ajay Joshi  
*Density Functional Theory (DFT) Study of Reaction Pathways*, (Delgass/Thomson), Air Products & Chemicals, Allentown, PA – Career Development Program Engineer

11. Shadab S. Mulla  
*Kinetic Measurement on Lean NOx Traps*, (Delgass/Ribeiro), Johnson Matthey Inc., Wayne, PA – Staff Scientist

12. Charles Schaffer  
*Investigators into the Reactivity and Catalytic Activity of Nanoporous Aluminosilicates and their Synthesis Precursors*, (Thomson), Air Products & Chemicals, Allentown, PA – Career Development Program Engineer

13. Eric A. Sherer  
*Age-Structured Cell Models in the Treatment of Leukemia: Identification, Inversion, and Stochastic Methods for the Evaluation and Design of Chemotherapy Protocols*, (Ramkrishna), IU Medical School, Indianapolis, IN – Postdoc

14. Shivani Syal  
*The Prediction of Glass Transition Temperature of Polycarbonates Using Physical Descriptors and Neural Networks*, (Caruthers/Venkatasubramanian), Exxon Mobil, Houston, TX – Senior Research Engineer

15. Vikrant N. Urade  
*Self-Assembly of Photovoltaic Nanomaterials*, (Hillhouse), Shell Technology India Pvt. Ltd., Bangalore, Karnataka, India – Tech, Development Engineer

16. Hsiang-Yu Wang  
*Microfluidic Electroporation and Cell Arrays*, (Wang/Lu), Brigham Young University, Provo, UT – Postdoc; National Cheng Kung University, Taiwan, ROC – Assistant Professor (starting Feb. 2009)

May 2008

17. Jennifer G. Bugayong  
*Model-Based Design and Optimization of Reversed-Phase Chromatographic Processes for Proinsulin Purification*, (Wang), Praxair, Inc., Tonawanda, NY – R & D Engineer

18. Robert T. Collins  
*Electrohydrodynamics of Free Surface Flows*, (Basaran/Harris), Sandia National Labs, Albuquerque, NM – Postdoc

19. Jin Il Kim  
*A Hybrid Cybernetic Modeling for the Growth of Escherichia coli in Glucose-Pyruvate Mixtures*, (Ramkrishna), Samsung Engineering, Gyeonggi-do, South Korea – Research Engineer

20. Gowri Krishnamurthy  
*Propane Aromatization over ZSM-5 Based Catalysts*, (Delgass), Air Products & Chemicals, Allentown, PA – Career Development Program Engineer

21. Avantika Shastri  
*Metabolic Flux Analysis of Photosynthetic Systems*, (Morgan), SABIC Innovatie Plastics, Bangalore, India – Research Scientist

22. Michael P. Tate  
*Nanomaterials for Thermoelectric Energy Conversion*, (Hillhouse), Dow Chemical, Midland, MI - Engineer

Forney Hall of Chemical Engineering
## Graduate Student Enrollment

**Fall 2007**

<table>
<thead>
<tr>
<th>Student</th>
<th>Major Professor</th>
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<td>Pavan Akkisetty</td>
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* B. S./M. S.
Facilities

Forney Hall of Chemical Engineering
In October 2004, the School of Chemical Engineering dedicated a 100,000 ft\(^2\) 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 2008.

Discovery Park
Since 2002, Discovery Park - made up of 10 centers - has grown from an idea to a $350 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, e-Enterprise, Advanced Manufacturing, 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 bioinformatics.

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 nanoscale 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.
e-Enterprise Center
The e-Enterprise Center focuses on new technology activities in three core areas: 1) network security and reliability, 2) management of distributed e-enterprise, and 3) logistics and product distribution and marketing of e-Enterprise. The Center brings together faculty and students with strengths in database systems design and integration engineering, software engineering, communication, management, operations systems, production systems, decision theory applications, system performance, risk evaluation, marketing, customer service and model simulation. Through this center, an entire business - commerce, supply chain, management, operations, product life-cycle control, customer service and data security - can be modeled, analyzed and made more efficient.

Center for Advanced Manufacturing
At the Center for Advanced Manufacturing, Purdue University researchers work to solve state and global manufacturing issues. The Center matches researchers with existing and emerging businesses in multiple technology areas – food and beverage, pharmaceuticals, petroleum and chemicals, computer and electronic components, transportation and more. Research is conducted on topics such as product and process design, foundational sciences, engineering, management, and workforce development. Chemical Engineering’s NSF-sponsored Pharmaceutical Engineering Research Center (ERC) is part of this Center.

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

Visitors

Visiting Faculty

Dr. Luis Puigjaner
UPC - ETSEIB
Dpt. Enginyeria Química, Barcelona, Spain
(7/7/08-9/23/08)

Dr. G.D. Yadav
Head, Dept. of Chemical Engineering
University Institute of Chemical Technology (UICT)
University of Mumbai
(9/1/07-11/30/07)

Academic Advisory Board

Formed in 2006 to provide input on academic issues, the Academic Advisory Board had its 2008 meeting on February 26 and 27. Current Board members, serving a 3-year term, are Kristi Anseth, Distinguished Professor, University of Colorado, Boulder; Alex Bell, Warren and Katharine Schlinger Distinguished Professor of Chemical Engineering, UC-Berkeley; Ignacio Grossman, Rudolph R. and Florence Dean University Professor of Chemical Engineering, Carnegie-Mellon University; Michael Ramage, Executive Vice President, ExxonMobil, (Retired); Greg Stephanopoulos, Bayer Professor of Chemical Engineering, MIT; and Matt Tirrell, Richard A. Auhll Professor and Dean of Engineering, UC-Santa Barbara.

Seminar Speakers

Professor Richard D. Noble, Department of Chemical Engineering, University of Colorado – Boulder, "Gas Separations Using Ionic Liquids & Polymers" (August 28, 2007)

Dr. Xiaomin Yang, Regional Technology Coordinator, BP, “Cellulosic Ethanol/Biofuel Production – Challenges, Technologies & Economics” (September 4, 2007)
Dr. Theo H. Fleisch, BP Distinguished Advisor, BP, "The New Syngas Conversion Business: Opportunities & Challenges" (September 11, 2007)

Professor Supriyo Datta, Department of Electrical & Computer Engineering, Purdue University, “Nanodevices & Maxwell's Demon” (September 18, 2007)

Professor John M. Vohs, Department of Chemical & Biomolecular Engineering, University of Pennsylvania, “Mechanistic Studies of Hydrogen Production from Methanol on PdZn Alloy Catalysts” (September 25, 2007)

Professor Steven M. Cramer, Department of Chemical & Biomolecular Engineering, Rensselaer Polytechnic Institute, “Protein Separations in Chromatographic Systems: A-priori prediction of protein affinity, selective displacers & generic antibody purification processes” (October 2, 2007)

Professor G. D. Yadav, Department of Chemical Engineering, University Institute of Chemical Technology University of Mumbai, “Selectivity Engineering in Synthesis of Fine Chemicals & Pharmaceuticals” (October 16, 2007)

Professor Christopher J. Roberts, Department of Chemical Engineering, University of Delaware, "Nonnative Protein Aggregation from a Multi-scale Biophysical & Modeling Approach" (October 23, 2007)

Professor Pedro E. Arce, Department of Chemical Engineering, Tennessee Tech University, “Tailoring the Nano-Architecture of Gel Materials for the Motion of Macromolecules: DNA vs. Nanoparticles” (November 13, 2007)

Professor Yan-Tin (Elizabeth) Shiu, Department of Bioengineering, University of Utah, “Effects of Hemodynamic Forces on Endothelial Cell Function” (November 27, 2007)

Professor Manos Mavrikakis, Department of Chemical & Biological Engineering, University of Wisconsin - Madison “Remarkable Catalysis by Core-Shell Alloy Nanoparticles” (December 4, 2007)

Professor Susannah Scott, Departments of Chemical Engineering and Chemistry & Biochemistry, University of California, Santa Barbara, “Activation of Polymerization Catalysts by and on Oxide Surfaces” (January 15, 2008)

Associate Dean Audeen Fentiman, College of Engineering, Purdue University “Responsible Conduct of Research” (January 17, 2008)

Dr. Ellen B. Stechel, Manager, Fuels and Energy Transitions, Sandia National Laboratories, “Moving Beyond a Fossil Fuel Dominated Energy System: Opportunities and Challenges” (February 5, 2008)

Professor Leonard Uitenham, Department of Chemical Engineering, North Carolina A&T State University, “Biodegradable Polymer Nano-composites” (February 12, 2008)

Professor Norman J. Wagner, Department of Chemical Engineering, University of Delaware, “The Rheology of Colloidal and Nanoparticle Dispersions: “STF Armor” – Nanoparticle Composites for Flexible Ballistic Materials” (February 19, 2008)

Professor B. Wayne Bequette, Department of Chemical & Biological Engineering, Rensselaer Polytechnic Institute, ”Biomedical and Pharmaceutical Applications of Systems and Control” (February 26, 2008)

Professor Yi Tang, Department of Chemical & Biomolecular Engineering, University of California, Los Angeles, “Exploring Natural Product Biosynthetic Pathways for Novel Enzymes and Useful Biocatalysts” (March 4, 2008)

Kelly Lectures
Dr. Pablo Debenedetti, Department of Chemical Engineering, Princeton University, “Water in Confinement” (March 18, 2008), “Statistical Characterization of Structure in Complex Systems” (March 19, 2008)

Dr. David Mirth, Vice President of Innovation for Insulating, Systems Business, Owens Corning, “Sustainability: How (and Why) Corporations Are Making a Difference” (April 1, 2008)
Professor Anuj Chauhan, Department of Chemical Engineering, University of Florida, “Ophthalmic Drug Delivery by Contact Lenses” (April 8, 2008)

Professor Matteo Pasquali, Department of Chemical & Biomolecular Engineering, Rice University, “Single Walled Carbon Nanotubes in Liquids.” (April 22, 2008)