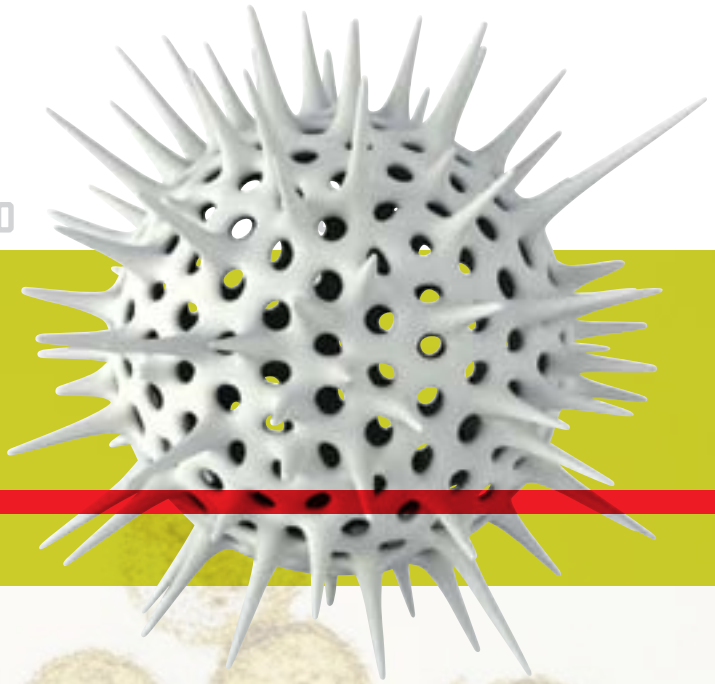

Chemical & Biomolecular ENGINEERING

ANNUAL REPORT 2011

UNIVERSITY of HOUSTON | ENGINEERING

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Message from the Chair

This annual report provides an update about the activities and accomplishments of the Department of Chemical and Biomolecular Engineering at the University of Houston. These are exciting times at UH, with a clear signal that the institution and the college are ready to catapult to the top tier by placing the success of our students at all levels, research excellence and community relevance and outreach as the critical routes for success. The Department of Chemical and Biomolecular Engineering continues to lead the way in each of these areas, as we continue to build on the cornerstones of our success for the last 59 years.

The department has seen unprecedented growth in the number of faculty, significant increase in the graduate and undergraduate population, and helps administer a growing and expanding Petroleum Engineering Program. In ChBE, we have added six new faculty over the last three years and will add two more this upcoming fall. The growth has occurred in the areas of materials, biomolecular engineering and environmental reaction engineering and in many ways reflects the evolution of the chemical engineering discipline. The number of incoming graduate students and post-doctoral researchers has significantly grown over the last two years and reflect the outstanding research productivity of the department.

The undergraduate program is healthy and continually evolving, and our graduates have witnessed a strong demand from the industry, especially those in energy and engineering design. The undergraduate curriculum continually evolves and reflects the changing needs of our field. For instance, in addition to a math and chemistry minor, we now offer nano Engineering and petroleum engineering minors that enable interested students to develop additional skills in cutting-edge and relevant areas without significantly increasing their credit hour requirements. We continue to incorporate an increased emphasis on the "soft skills" such as communications, ethics and life-long learning as well as discipline-critical safety and reliability practices into our courses. We continue to grow our partnership with East China University of Science and Technology, and several of their top undergraduate students spend their final year in residence at UH. These interactions have raised the consciousness of globalization in the field to our students and provide a fresh avenue for growth of our graduates.

The graduate program and research in the department are thriving, as measured through research publications and doctoral graduates. In the recent National Research Council rankings, the department was ranked in the top 15 departments nationwide on the basis of on-going research activities. Reaction engineering and catalysis, the highlight of the research in the department for many years, continues to grow. The department has one of the best faculty expertise in the area of environmental reaction engineering and the continuing growth of the Texas Diesel Testing and Research Center. Moreover, we now have critical mass in the area of biomolecular engineering and the faculty members from the department have leadership roles in the Western Regional Center of Excellence for Biodefense and Emerging Infectious Diseases as well as the Alliance for NanoHealth. In materials engineering, the department's two leading plasma engineers are critical leaders in the Department of Energy's Plasma Science Center. In the area of energy, the department plays a leading role in the National Wind Energy Center and is the academic home for the Petroleum Engineering Program. The Petroleum Engineering Program moved to newly renovated space in the UH Energy Research Park and is poised for significant growth in terms of faculty, graduate students and undergraduate students.

Ramanan Krishnamoorti
Dow Chair Professor & Department Chair

Please peruse this annual report and visit our department website (http://www.chee.uh.edu/). We greatly appreciate the feedback and suggestions from our colleagues in industry and academia, and we are especially interested in hearing from our undergraduate and graduate alums.

News Highlights

Chemical Engineering Shines in National Rankings

The University of Houston Cullen College of Engineering boasts one of the nation's top doctoral programs in chemical engineering. That's according to the most recent evaluation of Ph.D. programs released by The National Academies' National Research Council, widely considered the most sound and respected rankings in academia.

Based on data from 2005, the chemical engineering Ph.D. program placed 18th in the country in the NRC's survey-based rating, which measures a program against standards set by members of its discipline. By this metric, the UH Department of Chemical and Biomolecular Engineering bested its counterparts at nearby institutions such as Rice University and Texas A&M, as well as at highly regarded universities from around the country, including Cornell, Penn State and Georgia Tech. The University of Texas at Austin was the only school in the region to rank higher.

The department fared even better in the NRC's research activity evaluation, which factored in publications, citations, the percent of the faculty holding research grants, and recognition of scholarship as evidenced by honors and awards. In this category, the college's chemical engineering Ph.D. program ranked 13th in the country.

"Though these rankings are a bit dated, they reveal the strength of this department," said Ramanan Krishnamoorti, chair of chemical and biomolecular engineering at the Cullen College. "While I'm very happy with our performance, with the addition of outstanding faculty members and the growth we've undergone in recent years, I'm confident that today, we would rank even higher."

New Director Named For Petroleum Engineering Program

A longtime Shell researcher has been appointed to lead the UH Petroleum Engineering Program. Thomas K. Holley, a senior staff geophysicist with the global energy and petrochemical company, began at UH in Spring 2010. He succeeds Ray Flumerfelt, who has served as director of the program since fall 2008. An increasingly rare commodity, petroleum engineers work with geologists—searching the world for reservoirs containing oil or natural gas and later designing methods and equipment to effectively extract these resources.

Diesel Center Researchers Earn EPA Grant to Retrofit School Buses

Using a $1 million grant from the U.S. Environmental Protection Agency, the Texas Diesel Testing and Research Center at the University of Houston will retrofit school buses with a system that attempts to diminish the negative impact their diesel emissions can have on the environment. UH researchers will supervise the installation of Nett Technologies' BlueMAX Selective Catalytic Reduction System on 10 area buses. Then, over the course of the next two years, they will analyze the system's ability to reduce smog-causing Nitrogen Oxides (NOx) and sooty particles being released through emissions using a series of real-world tests.

Win at Regional Chem-E Car Competition Sends UH Team to 2010 Nationals

It may not have been as sleek as other entries, but the Cougalac stole the show at the Chem-E Car Competition held at the American Institute of Chemical Engineers (AIChE) 2010 Southwest Regional Conference. Named after its bulky, gas-guzzling relative—the Cadillac—the 26-pound car earned a team of eight chemical engineering students from the University of Houston a first place win and a ticket to the national competition in Salt Lake City, Utah last November.

SPE Student Chapter Earns Honors

The University of Houston-Rice University student chapter of the Society of Petroleum Engineers (SPE) was named Chapter of the Month for April. The international SPE office chose the group for their achievements from 190 chapters worldwide. The organization's drive to be more active helped earn them the honor. Throughout the year, the group hosted a seminar on globalization as well as several technical speakers on subjects ranging from offshore drilling to enhanced oil recovery.

DOE Grant to Establish Wind Facility

Efforts by the University of Houston to become a national leader in offshore wind technology received a huge boost from the U.S. Department of Energy, which recently awarded university researchers $2.3 million to establish a testing facility. Slated to be located in the newly acquired UH Energy Research Park, grant funds will aid researchers in The National Wind Energy Center (NWEC) to develop and test composite materials and components for large offshore wind turbines. Throughout the duration of the two-year grant, the founding members of NWEC plan to partner with others in the Cullen College as well as industry to solve these and other problems facing wind.

UH Researchers Developing Nanoscale Manufacturing Technique

Researchers at the University of Houston Cullen College of Engineering have received a grant to develop a method for mass-producing devices less than 10 nanometers in size, addressing one of the most significant barriers to their widespread use. Vincent Donnelly and Demetre Economou, both professors with the Department of Chemical and Biomolecular Engineering, received a three-year, $450,000 grant from the National Science Foundation to develop their nanopantography method of nanoscale fabrication.

Luss Receives International Award for Chemical Reaction Engineering

The International Symposium for Chemical Reaction Engineering (ISCRE) has named University of Houston Professor Dan Luss the 2010 recipient of the Neal R. Amundson Award for Excellence in Chemical Reaction Engineering. One of the highest honors in the field, the Amundson Award is bestowed every three years to recognize a pioneer in the field of chemical reaction engineering. Much of Luss' research has focused on the safe operation of potentially unstable chemical reactors. Because chemical reactors have varying steady states, the risk of a catastrophic event during start up or operation is extremely high.

Departmental Support

As of September 2010, the UH CHBE research program comprised 73 full- and part-time graduate students, 12 postdoctoral fellows, 62 Petroleum Engineering graduate students, and 28 part-time Master of Chemical and Engineering students (the industrially employed professionals who are attracted to our non-thesis terminal-degree option). The graduate program is supported by the following sources:

State of Texas		
Departmental Operations	$	2,724,983
Research	$	2,421,518
Renovations	$	479,969
Equipment	$	525,314
	$	**6,151,784**
Federal Agencies		
NSF	$	719,835
NASA	$	33,925
UH Homeland Sec/Dept of Interior	$	44,204
US-Foreign Support	$	15,930
NIH	$	172,134
DOE(nergy)/EPA	$	2,725,054
DOEducation	$	58,844
Other	$	365,884
	$	**4,135,810**
University Funds		
Endowments & Fees	$	132,845
	$	**132,845**
Private Grants		
Foundations	$	82,954
Institutes/Universities	$	631,306
City of Houston	$	10,454
Metro Transit Authority	$	2,709
	$	**727,423**
Industrial		
Multinational Corporations	$	433,597
Local Industrial Funds	$	337,896
	$	**771,493**
Grand Total	**$**	**11,919,355**

Donor Organizations

The Department of Chemical Engineering is most grateful for the support contributed by these industrial, educational and nonprofit organizations:

AIChE

BASF Corporation

Bayer Corporation

BP

CAChE Corporation

Chevron U.S.A. Inc.

ConocoPhillips

Council for Chemical Research

Devon Corporation

The Dow Chemical Company Fdn.

The Dow Chemical Company

E.I. DuPont de Nemours & Company

Ethyl Corporation

ExxonMobil Foundation

ExxonMobil Corporation

Fluor Corporation

FMC Corporation

Halliburton Foundation Inc.

The Lubrizol Foundation

Marathon Oil Company

Occidental Petroleum Charity Fdn.

Shell Oil Company Foundation

Total Corporation

Tokyo Electron

UH Engineering Alumni Organization

New Faculty

Megan L. Robertson joined the department in the fall of 2010. She received a Ph.D. in chemical engineering from the University of California, Berkeley in 2006, advised by Prof. Nitash P. Balsara. Her graduate research focused on the design of block copolymer surfactants for the preparation of nanostructured materials from immiscible polymers.

Megan Robertson

Following graduation, she worked as a senior scientist at Rohm and Haas (now Dow Chemical) in Spring House, Penn. on the structural characterization of colloidal dispersions under shear and the emulsion polymerization of polymer latex. She then went to the University of Minnesota as a postdoctoral research associate in the Department of Chemistry, advised by Dr. Marc A. Hillmyer. Her postdoctoral research focused on improving the physical properties of polymers derived from renewable, non-petroleum sources.

Prof. Robertson plans to establish a research group that will work at the interface between polymer chemistry and physics to produce nanostructured polymeric materials for a variety of applications. She will focus on the derivation of materials from renewable sources and biodegradable materials for biomedical applications.

In the fall of 2010, **Navin Varadarajan** joined the department as an assistant professor. He received his Ph.D. in chemistry from The University of Texas at Austin in December of 2006. His dissertation work, which was done under the supervision of Prof. George Georgiou and Professor Brent Iverson, focused on a combination of molecular biology, biotechnology and chemistry applied specifically to protease engineering. After obtaining his degree, he stayed at UT as a post-doctoral researcher working on proteases that selectively recognize post-translational modifications (sulfo-tyrosine and 3-nitro tyrosine) and also simultaneously worked on engineering single chain fragments specific for light-modulated antigens. Prior to joining the department, he conducted post-doctoral research at the Chemical Engineering Department at the Massachusetts Institute of Technology, working with Prof. Chris Love to develop high-throughput immunological assays to study human immunodeficiency virus – 1(HIV-1) infection.

Navin Varadarajan

Prof. Varadrarjan would like to establish a multi-disciplinary research group that will integrate skills from engineering, chemical and biological sciences. He believes that the collaborative research group should lead to significant contributions in immunology and would serve as a platform for training scientific minds.

Texas Diesel Testing and Research Center

The Texas Diesel Testing and Research Center (TDTRC), administered within the department, comprises faculty and staff who are researching, developing, and testing technologies focused on clean diesel and alternative fuels. The TDTRC Principal Investigator is Mike Harold, professor of CHBE, and Director is Mickey Rooks, research Professor of CHBE. Harold and Rooks lead a team of 15 engineers and staff, and collaborate with other faculty members in CHBE and Mechanical Engineering on basic research and technology development. The center has research capabilities spanning bench scale testing of emerging technologies to full scale testing of heavy duty diesel vehicles. The main components of the facility are a 500hp AC chassis dynamometer test cell, a 600 hp AC engine dynamometer test cell, a portable emissions measurement system, and a comprehensive research laboratory. The main focus of the testing activities is on retrofit technologies to decrease NOx

and particulate matter (PM) emissions from on-road and off-road vehicles and equipment. The research activities focus on the reaction engineering of advanced catalytic aftertreatment technologies, synthetic fuels and additives, and biofuels in terms of emissions, fuel economy and sustainability.

During the past year TDTRC completed a successful $12 million expansion funded by the Texas Commission on Environmental Quality (TCEQ). The main elements of the expansion included the installation and commissioning of the heavy-duty engine dynamometer, the acquisition of a portable emissions measurement system (PEMS), the upgrade of an existing heavy-duty chassis dynamometer, and the expansion of research lab capabilities. Several new projects carried by TDTRC were funded, including three totaling about $3 million from the U.S. Environmental Protection Agency, TCEQ, and third-party companies. Additional research projects in association with TDTRC included two grants from the U.S. Department of Energy totaling about $3 million. Research and technology development includes evaluation with the PEMS and chassis dynamometer of retrofit aftertreatment technologies developed by Nett Technology Inc., Shadowood LLC, and TECT LC; research on ammonia-based selective catalytic reduction, biodiesel and gas-to-liquid fuels, and conversion of microalgae into fungible liquid fuels; and coupled lean NOx trap and selective catalytic reduction.

UH NanoFabrication Facility

The UH Nanofabrication Facility is a 3,000 square foot clean room that houses the only shared nano fabrication resources in the Greater Houston area. The facility is managed by the Cullen College of Engineering and is co-sponsored by the Alliance for NanoHealth (http://www.nanohealthalliance.org/). It is located in the Science and Engineering Research Center at UH.

The clean room houses sophisticated instrumentation to support materials and device research programs. Research areas that benefit from the facility include nanomagnetic devices, biosensors, drug/gene delivery, resistive memory, chemically-amplified imaging materials, nanowire interconnects, nanoscale light sources, nanostructured photovoltaics, and microfluidics. Major equipment items include a "dual-beam" focused-ion/scanning-electron microscope, electron-beam patterning

with a nanopattern generation system, contact aligner for photolithography, atomic force microscope, ultra-high vacuum sputter deposition system, multiple reactive ion etch systems, and four modern fume hoods for wet chemistry. The facility was awarded an NSF MRI grant to purchase and install a dedicated 50 keV electron-beam lithography system for large-area patterning at the scale of 10 nm.

Predictive Control of Plasma Kinetics: Bounded and Multiphase Systems

Professors Vincent Donnelly and Demetre Economou are co-PIs in a 5-year, $20 million Plasma Science Center (PSC) funded by the U.S. Department of Energy. The PSC is directed by Professor Mark Kushner of the University of Michigan. The University of Houston joins about a dozen other universities and national laboratories in an effort to understand and control the kinetics of low temperature plasmas of the kind used in such diverse applications ranging from microelectronics manufacturing to plasma surgery.

Professors Donnelly and Economou use a combined modeling and experimental approach to improve understanding and control of the plasma charged particle energies. The unique approach involves rapidly turning the plasma on and off

to cool down these species, while applying voltage pulses to the plasma boundary. With this advanced control, many new applications could emerge for plasma processing. For example, plasmas are currently used for etching nanometer-scale patterns into silicon and other materials for integrated circuits. With finer control of the plasma energies, the main focus of this center, this patterning technique will be extended to atomic scale features.

Faculty

Vemuri Balakotaiah

Professor Balakotaiah's research involves mathematical modeling and analysis of the interactions between the transport processes and chemical reactions in various systems of engineering interest. The objective of the research is to gain a fundamental understanding of the complex behavior of these systems and use this understanding to practical advantage. His group's current research projects include modeling and analysis of catalytic monoliths (for pollution-reduction in automobiles, oxidation of VOCs, power generation, and removal of NOx from exhaust gases); numerical computation and bifurcation analysis of homogeneous and wall-catalyzed reacting flows; spatiotemporal patterns in catalytic reactions and reactors; experimental and modeling studies on wavy films, gas-liquid flows in packed-bed under normal and microgravity conditions, modeling and simulation of reactive dissolution of carbonate rocks, modeling of reactive gas-exchange in the lung and development of low-dimensional models for chemical reactors and reacting flows.

Publications:

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4. Joshi, S.Y., Harold, M.P., Balakotaiah, V., "Overall Mass Transfer Coefficients and Controlling Regimes in Catalytic Monoliths," *Chemical Engineering Science,* (2010) 65 (5), 1729-1747.
5. Kumar, A., Harold, M.P., Balakotaiah, V., "Isotopic Studies of NOX Storage and Reduction on Pt/BaO/Al2O3 Catalyst Using Temporal Analysis of Products," *Journal of Catalysis,* (2010) 270 (2), 214-223.
6. Bhatia, D., Clayton, R.D., Harold, M.P., Balakotaiah, V., "A Global Kinetic Model for NOx Storage and Reduction on Pt/BaO/Al2O3 Monolithic Catalysts," *Catalysis Today,* (2009) 147, S250-S256.
7. Bhatia, D., Harold, M.P., Balakotaiah, V., "Kinetic and Bifurcation Analysis of the Cooxidation of CO and H-2 in Catalytic Monolith Reactors," *Chemical Engineering Science,* (2009) 64 (7), 1544-1558.
8. Bhatia, D., McCabe, R.W., Harold, M.P.; Balakotaiah, V., "Experimental and Kinetic Study of NO Oxidation on Model Pt Satalysts," *Journal of Catalysis,* (2009) 266 (1), 106-119.
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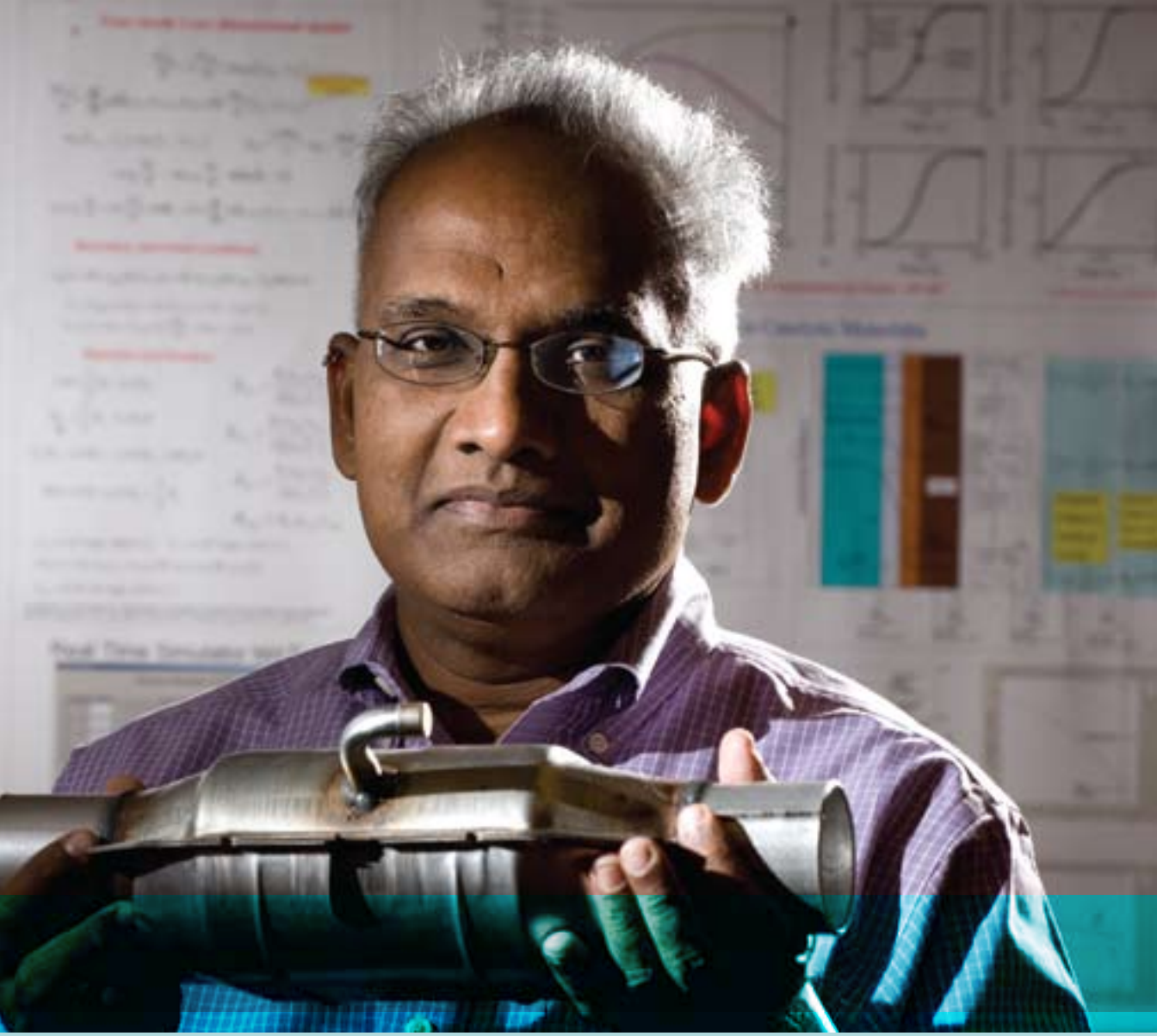
11. Joshi, S.Y.; Harold, M.P.; Balakotaiah, V., "On the Use of Internal Mass Transfer Coefficients in Modeling of Diffusion and Reaction in Catalytic Monoliths," *Chemical Engineering Science,* (2009) 64 (23), 4976-4991.
12. Joshi, S.Y., Harold, M.P., Balakotaiah, V., "Low-Dimensional Models for Real Time Simulations of Catalytic Monoliths," *AIChE Journal,* (2009) 55 (7), 1771-1783.
13. Kalia, N., Balakotaiah, V., "Effect of Medium Heterogeneities on Reactive Dissolution of Carbonates," *Chemical Engineering Science,* (2009) 64 (2), 376-390.
14. Kumar, A., Medhekar, V., Harold, M.P., Balakotaiah, V., "NO Decomposition and Reduction on Pt/Al2O3 Powder and Monolith Catalysts Using the TAP Reactor," *Applied Catalysis B-Environmental,* (2009) 90 (3-4), 642-651.
15. Xu, J., Harold, M.P., Balakotaiah, V., "Microkinetic Modeling of Steady-State NO/H-2/O-2 on Pt/BaO/Al2O3 NOx Storage and Reduction Monolith Catalysts," *Applied Catalysis B-Environmental,* (2009) 89 (1-2), 73-86.



GRANTS:

$ 50,000	The Welch Foundation, "Modeling & Analysis of Spatiotemporal Patterns in Chemical Reactors & Reacting Flows," 6/08-5/09
$ 3,789,726	City of Houston, Texas, "Evaluation and Testing of Emission Control Devices for Diesel Exhaust Abatement," jointly with M.P. Harold and J.T. Richardson, 8/02-8/09
$ 10,192,172	Texas Commission on Environmental Quality, "Establishment of the University of Houston Texas Diesel Emission Testing and Research Laboratory," jointly with M.P. Harold and C.W. Rooks, 9/07-8/09
$ 50,000	The Welch Foundation, "Modeling and Analysis of Spatiotemporal Patterns in Chemical Reactors and Reacting Flows," 6/09-5/10
$ 715,661	US Department of Energy - National Energy Technology Laboratory, "Kinetic and Performance Studies of the Regeneration Phase of Model Pt/Ba/Rh Nox Traps for Design and Optimization," jointly with M.P. Harold, 10/05-5/10
$ 475,750	US Department of Energy - Golden Field Office, "Center for Clean Fuels and Power Generation," jointly with M. Franchek, M.P. Harold and K. Grigoriadis, 10/09-10/10
$ 70,000	Halliburton Energy Services, "Modeling and Analysis of Carbonate Acidization," 5/09-5/11
$ 1,557,242	Texas Commission on Environmental Quality, "UH SCR Project: Texas Diesel Emission Testing & Research Laboratory - Testing, Research and Development Phase," jointly with M.P. Harold, R. Muncrief and C.W. Rooks, 5/09-5/11
$ 243,613	National Science Foundation, "A Systems Approach to Ultra-Clean and Ultra-Efficient Internal Combusion Engines," jointly with M. Franchek and K. Grigoriadis, 9/07-8/11
$ 50,000	The Welch Foundation, "Effect of Heterogeneties on Spatiotemporal pattern Formation in chemical Reactors," 6/10-5/12
$ 2,217,317	US Department of Energy - National Energy Technology Laboratory, "Development of Optimal Catalyst Designs and Operating Strategies for Lean Nox Reduction in coupled LNT-SCR Systems," jointly with M.P. Harold and D. Luss, 9/09-9/12
$ 350,000	National Aeronautics and Space Administration-Glenn Research Center, "Packed-Bed Reactor Experiment," 4/10-10/13

Jacinta Conrad

Professor Conrad's research is focused on investigating the flow properties of complex fluid systems. Her research focuses on two main areas: first, exploiting microfluidic and microfabrication techniques to produce novel microstructured materials for transport studies and energy applications; second, elucidating the interplay between confinement and flow properties of complex fluids and soft materials, with applications in biofluid transport, microbial motility, biosensing, bioremediation and water purification.

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2. Conrad, J.C., Wyss, H.M., Manley, S., Trappe, V., Miyazaki, K., Kaufman, L.J., Schofield, A.B., Reichman, D.R., Weitz, D.A., "Arrested Fluid-Fluid Phase Separation in Depletion Systems: Implications of the Characteristic Length on Gel Formation and Rheology," *J. Rheol.,* (2010) 54, 412.
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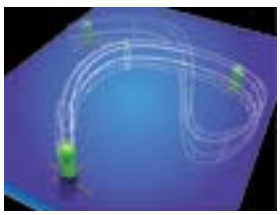
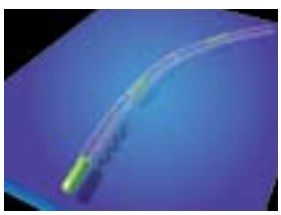
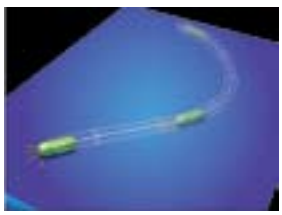
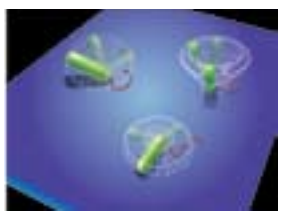
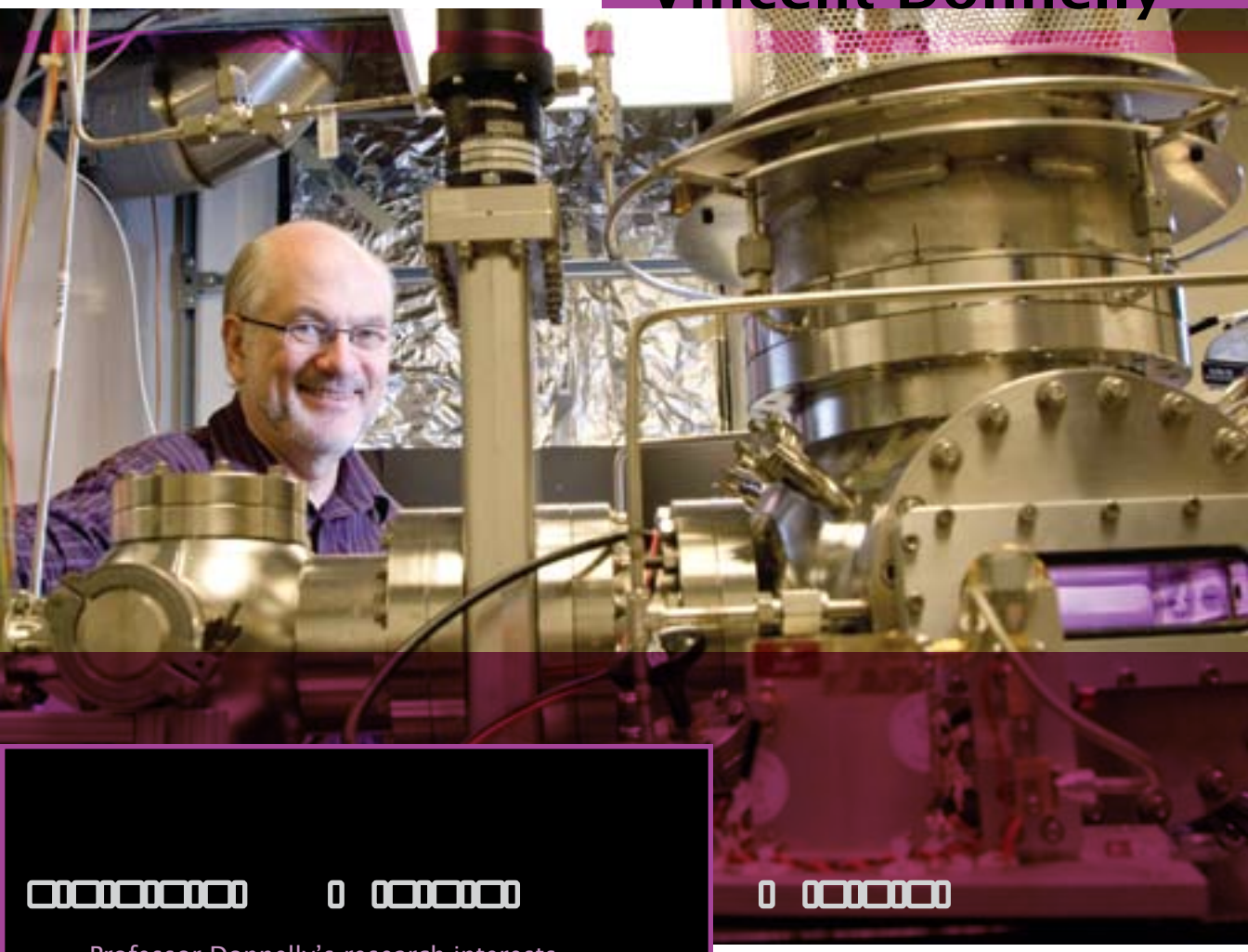





Vincent Donnelly



Professor Donnelly's research interests are mainly in materials processing, and particularly plasma processing. He extends current knowledge about plasma physics and chemistry to even smaller nanoscale features. His current and future interests in experimental plasma diagnostics include development of optical diagnostic techniques for plasma processing, measurement of electron temperatures and energy distributions, and studies of plasma-surface interactions during etching of silicon and other microelectronic materials.

Publications:

1. Belostotskiy, S.G., Ouk, T., Donnelly, V.M., Economou, D.J., Sadeghi, N., "Gas Temperature and Electron Density Profiles in an Argon DC Microdischarge Measured by Optical Emission Spectroscopy," *Journal of Applied Physics,* 107 (5).
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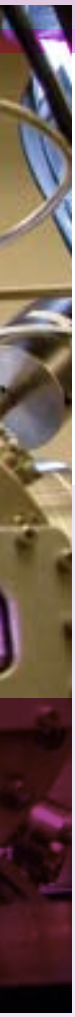
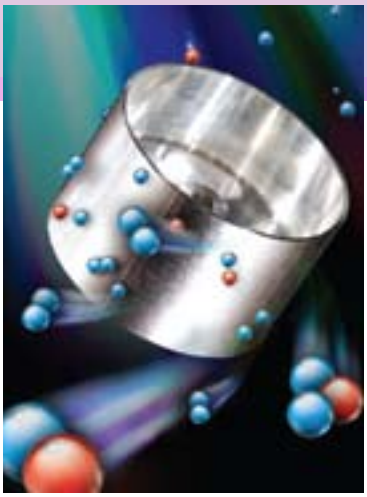
3. Chen, Z.Y., Donnelly, V.M., Economou, D.J., Chen, L., Funk, M., Sundararajan, R., "Measurement of Electron Temperatures and Electron Energy Distribution Functions in Dual Frequency Capacitively Coupled Cf4/O-2 Plasmas Using Trace Rare Gases Optical Emission Spectroscopy," *Journal of Vacuum Science & Technology A,* (2009) 27 (5), 1159-1165.





4. Guha, J., Donnelly, V.M., "Studies of Chlorine-Oxygen Plasmas and Evidence for Heterogeneous Formation Of Clo and Clo2," *Journal of Applied Physics,* (2009) 105 (11).
5. Guha, J., Donnelly, V.M., "Auger Electron Spectroscopy Study of Reactor Walls in Transition From an O-2-A Cl-2 Plasma," *Journal of Vacuum Science & Technology A,* (2009) 27 (3), 515-520.
6. Guha, J., Khare, R., Stafford, L., Donnelly, V.M., Sirard, S., Hudson, E.A., "Effect of Cu Contamination on Recombination of O Atoms on a Plasma-Oxidized Silicon Surface," *Journal of Applied Physics,* (2009) 105 (11).
7. Stafford, L., Khare, R., Donnelly, V.M., Margot, J., Moisan, M., "Electron Energy Distribution Functions in Low-Pressure Oxygen Plasma Columns Sustained by Propagating Surface Waves," Applied Physics Letters, (2009) 94 (2).
8. Stafford, L., Khare, R., Guha, J., Donnelly, V.M., Poirier, J.S., Margot, J., "Recombination of Chlorine Atoms on Plasma-Conditioned Stainless Steel Surfaces in the Presence of Adsorbed Cl-2," *Journal of Physics D-Applied Physics,* (2009) 42 (5).
9. Wang, C., Donnelly, V.M., "Dilute Hydrogen Plasma Cleaning of Boron From Silicon After Etching of Hfo2 Films in Bcl3 Plasmas: Substrate Temperature Dependence," *Journal of Vacuum Science & Technology A,* (2009) 27 (1), 114-120.

Grants:

$ 100,000 Texas Higher Education Coordinating Board - ARP, "A Novel Method for Massively Parallel Formation of Nanometer Scale Patterns and Shapes," jointly with D. Economou, 5/06-1/09

$ 100,000 Tokyo Electron America, "IED and EED Measurements in Plasma Reactors," jointly with D. Economou, 5/08-5/09

$ 296,142 National Science Foundation, "MRI: Development of an Energetic Atom Beam Lithography System for Nanosystem Protogyping nad Manufacturing," jointly with D. Economou, P. Ruchhoeft, D. Litvinov and J.C. Wolfe, 9/05-8/09

$ 90,000 Tokyo Electron America, "Advanced TRG-OES Applied-CCP Reactors," jointly with D. Economou, 10/08-9/09

$ 470,000 US Department of Energy - Chicago Operations Office, "Spatially Resolved Diagnostics and Modeling of Microhollow Discharges," jointly with D. Economou, 8/06-12/09

$ 5,962 National Science Foundation, "Systematic Studies of Plasma Reactions on Dynamic Surfaces, Using a Novel Rotating Substrate," 4/10

$ 299,999 National Science Foundation, "Systematic Studies of Plasma Reactions on Dynamic Surfaces, using a Novel Rotating Substrate," 5/07-4/10

$ 5,962 National Science Foundation, "Systematic Studies of Plasma Reactions on Dynamic Surfaces, Using a Novel Rotating Substrate," 7/09-4/10

$ 177,010 Supplemental equipment grant, Department of Energy, "Ultra High Vacuum-Atomic Force Microscopy/Scanning Tunneling Microscopy (UHV-AFM/STM) System, jointly with V. Donnelly, 1/10-12/10

$ 150,000 Supplemental equipment grant, Department of Energy, "Spectroscopic Ellipsometer," jointly with V. Donnelly, 1/10-12/10

$ 35,000 Lam Research Corp., Gift for Plasma Research, 1/10-1/11

$ 100,000 Varian Semiconductor Equipment, "Precision Etching Using Pulsed Plasma with Synchronous Substrate Bias," jointly with D. Economou, 3/10-2/11

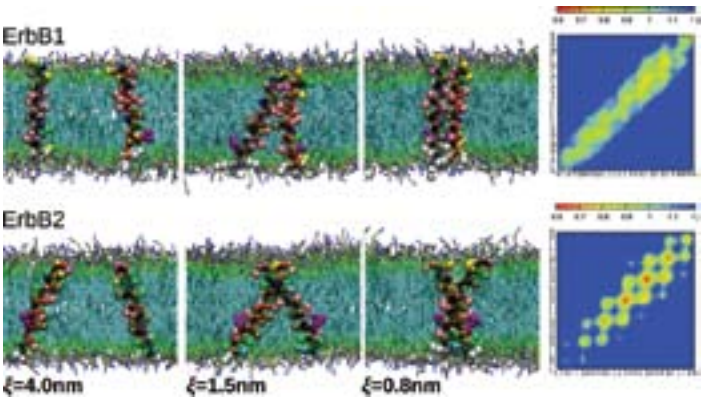
$ 25,000 GEAR - UH - Grant-Enhance and Advance Research, "A Novel method for Rapid Atomic Layer Deposition and Etching of Thin Films," Sole PI, 6/10-5/11

$ 800,000 National Science Foundation, "ARRA - MRI-R2 Consortium: Acquisition of an Electron Beam Lithography System-Support Transformative Device and Materials Research in the Greater Houston Area," jointly with D. Economou, P. Ruchhoeft, D. Litvinov and G. Stein, 3/10-2/12

$ 344,997 US Department of Energy - Office of Science, "Pulsed Plasma with Synchronous Boundary Voltage for Rapid Atomic Layer Etching," jointly with D. Economou, 8/09-8/12

$ 200,000 National Science Foundation, "Pulsed Plasma with Synchronous Boundary Voltage for Rapid Atomic Layer Etching," jointly with D. Economou, 9/09-8/12

$ 1,025,000 University of Michigan, "Plasma Science Center: Predictive Control of Plasma Kinetics: Multi-Phase and Bounded Systems," jointly with D. Economou, 8/09-8/14



Manolis Doxastakis

Professor Doxastakis' research focuses on the development and application of molecular modeling methodologies to study equilibrium structures, fluctuations, and dynamics of multicomponent systems consisting of polymers, proteins and lipids. Together with the use of advanced experimental techniques, molecular simulations provide a unique molecular level view of cell membranes, membrane proteins and self-assembly and dynamics of mixtures of macromolecules. Specific projects in Doxastakis' group include the study of the factors controlling the association of transmembrane proteins and the structure and dynamics of polymer-particle mixtures.

Publications:

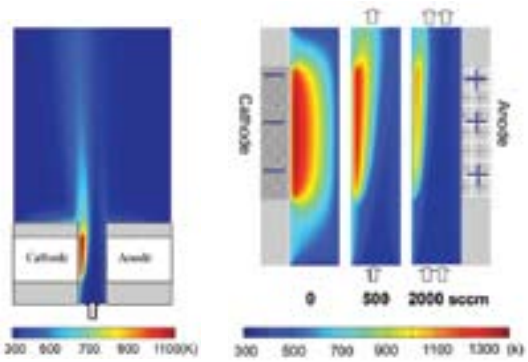
1. Janosi, L., Prakash, A. and Doxastakis, M., "Lipid-Modulated Sequence-Specific Association of Glycophorin A in Membranes," *Biophys. J.,* (Accepted)
2. Doxastakis, M., "Molecular Modeling of Polymers and Biomolecules," *McGraw-Hill 2010 Yearbook of Science & Technology,* McGraw-Hill, (2010).
3. Janosi, L., Doxastakis, M., "Accelerating Flat-Histogram Methods for Potential of Mean Force Calculations," *Journal of Chemical Physics,* (2009) 131 (5).

Grants:

$	27,000	GEAR - UH - Grant-Enhance and Advance Research, "Molecular Design of Thermoresponsive Polymer Surfaces," Sole PI, 6/08-5/09
$	3,000	Small Grants Program UH, "Modeling of Microscopic Wetting Phenomena," Sole PI, 1/10-8/10

The research of Professor Economou includes: Atomic Layer Etching: New methods for etching a solid with monolayer accuracy; Predictive control of plasma kinetics: Combined experimental/simulation project to determine reactor operating parameters resulting in a-priori specified ion and electron energy distribution functions; Nanopantography: a new technique for large-area, massively parallel fabrication of complex nano-patterns; and Plasma enhanced CVD of nanocrystalline silicon using a novel rotating substrate reactor.

Demetre Economou



Gas Temperature

Temperature distribution in a parallel plate microplasma reactor. The Cathode-Anode separation is 300 microns. As the gas flow rate increases from 0-2000 std. cm3/min, the boundary layer thins down and the temperature decreases due to convective losses.

Publications:

1. Belostotskiy, S.G., Ouk, T., Donnelly, V.M., Economou, D.J., Sadeghi, N., "Gas Temperature and Electron Density Profiles in an Argon DC Microdischarge Measured by Optical Emission Spectroscopy," *Journal of Applied Physics*, (2010) 107(5), 053305 (7 pages).
2. Belostotskiy, S.G., Donnelly, V.M., Economou, D.J., Sadeghi, N., "Spatially Resolved Measurements of Argon Metastable (1s(5)) Density in a High Pressure Microdischarge Using Diode Laser Absorption Spectroscopy," *IEEE Transactions on Plasma Science,* (2009) 37 (6), 852-858.
3. Chen, Z.Y., Donnelly, V.M., Economou, D.J., Chen, L.; Funk, M., Sundararajan, R., "Measurement of Electron Temperatures and Electron Energy Distribution Functions in Dual Frequency Capacitively Coupled CF4/O-2 Plasmas Using Trace Rare Gases Optical Emission Spectroscopy," *Journal of Vacuum Science & Technology A,* (2009) 27 (5), 1159-1165.
4. Economou, D.J., "Modeling and Simulation of Fast Neutral Beam Sources for Materials Processing," *Plasma Processes and Polymers,* (2009) 6 (5), 308-319.

Grants:

$ 100,000 Texas Higher Education Coordinating Board - ARP, "A Novel Method for Massively Parallel Formation of Nanometer Scale Patterns and Shapes," jointly with V. Donnelly, 5/06-1/09

$ 100,000 Tokyo Electron America, "IED and EED Measurements in Plasma Reactors," jointly with V. Donnelly, 5/08-5/09

$ 296,142 National Science Foundation, "MRI: Development of an Energetic Atom Beam Lithography System for Nanosystem Protogyping Nad Manufacturing," jointly with J. Wolfe, D. Litvinov, V. Donnelly and P. Ruchhoeft, 9/05-8/09

$ 90,000 Tokyo Electron America, "Advanced TRG-OES Applied to CCP Reactors," jointly with V. Donnelly, 10/08-9/09

$ 470,000 US Department of Energy - Chicago Operations Office, "Spatially Resolved Diagnostics and Modeling of Microhollow Discharges," jointly with V. Donnelly, 8/06-12/09

$ 177,010 Supplemental equipment grant, Department of Energy, "Ultra High Vacuum-Atomic Force Microscopy/Scanning Tunneling Microscopy (UHV-AFM/STM) system, jointly with V. Donnelly, 1/10-12/10

$ 150,000 Supplemental equipment grant, Department of Energy, "Spectroscopic Ellipsometer," jointly with V. Donnelly, 1/10-12/10

$ 100,000 Varian Semiconductor Equipment, "Precision Etching Using Pulsed Plasma with Synchronous Substrate Bias," jointly with V. Donnelly, 3/10-2/11

$ 800,000 National Science Foundation, "ARRA - MRI-R2 Consortium: Acquisition of an Electron Beam Lithography System to Support Transformative Device and Materials Research in the Greater Houston Area," jointly with D. Litvinov, G. Stein, V. Donnelly, 3/10-2/12

$ 344,997 US Department of Energy - Office of Science, "Pulsed Plasma with Synchronous Boundary Voltage for Rapid Atomic Layer Etching," jointly with V. Donnelly, 8/09-8/12

$ 200,000 National Science Foundation, "Pulsed Plasma with Synchronous Boundary Voltage for Rapid Atomic Layer Etching," jointly with V. Donnelly, 9/09-8/12

$1,025,000 Department of Energy / University of Michigan, "Plasma Science Center: Predictive Control of Plasma Kinetics: Multi-Phase and Bounded Systems," jointly with V. Donnelly, 8/09-8/14

$ 200,000 National Science Foundation, "Pulsed Plasma with Synchronous Boundary Voltage for Rapid Atomic Layer Etching," jointly with V. Donnelly, 9/09-8/12

$ 1,025,000 University of Michigan, "Plasma Science Center: Predictive Control of Plasma Kinetics: Multi-Phase and Bounded Systems," jointly with V. Donnelly, 8/09-8/14

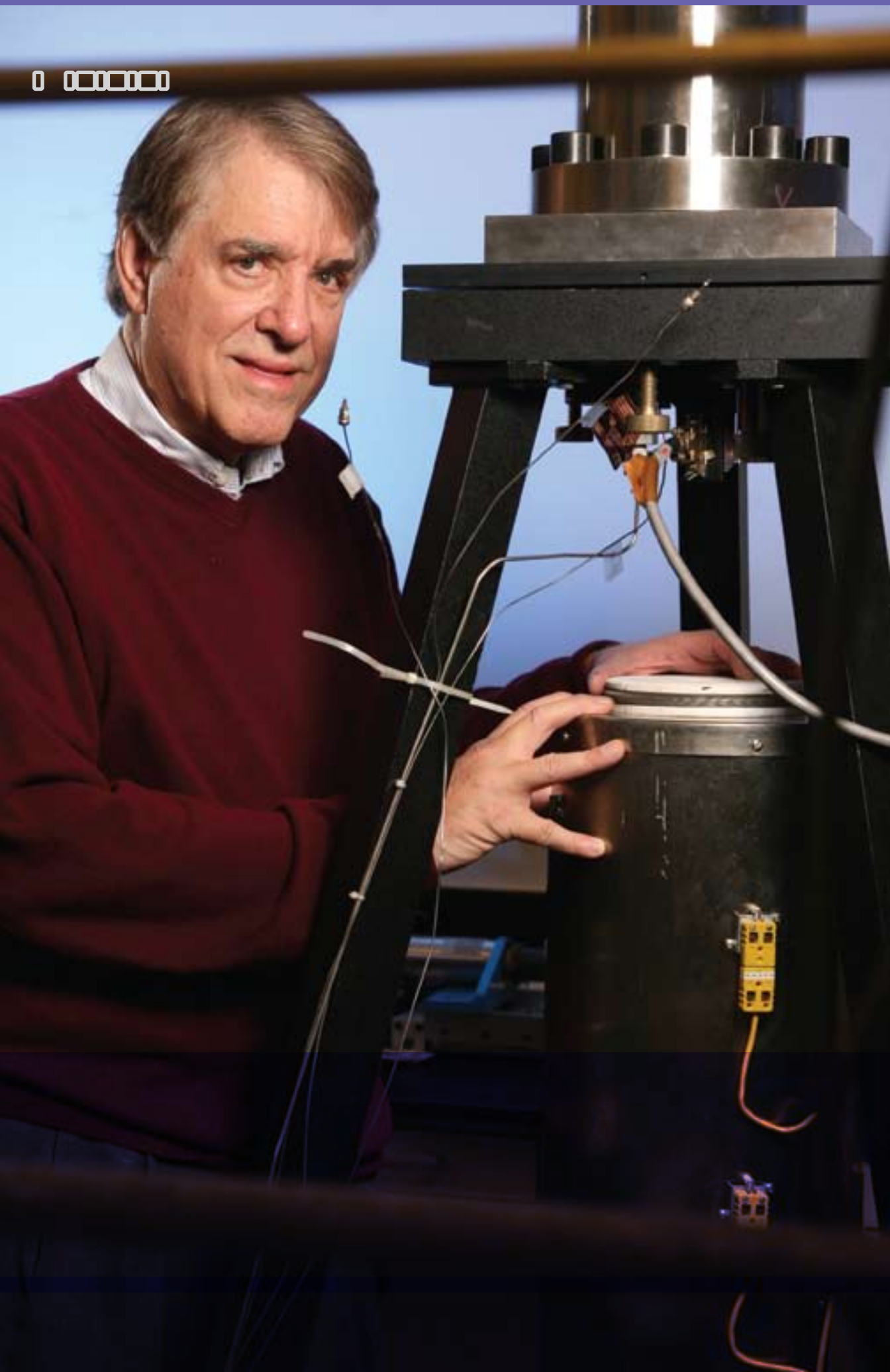
Research Interests

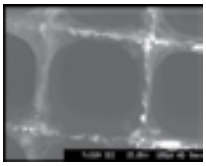
The research interests of Professor Flumerfelt fall in the general area of multiphase and interfacial transport phenomena as applied to complex cellular materials and composite systems. Particular emphasis is in understanding the relations between base material properties, interfacial properties, and processing methods in controlling resulting end structures and end structure material properties. Such understanding, coupled with multi-scale modeling and experimentation, provides a basis for achieving controlled structures and structures with predictable structure property relations. Applications include a spectrum of micro and macro cellular materials involving thermoplastic and thermoset polymers with different fiber elements. Current studies involve epoxy and polymer composites (including foam structures) for large scale wind energy systems as well as various industrial and biomedical applications. Inside these programmatic projects, we conduct detailed studies of surface/polymer bonding and degradation, cellular nucleation and growth, as well as studies of process mechanics and mechanisms. Ultimately the objective is obtaining higher performance materials for the applications involved.

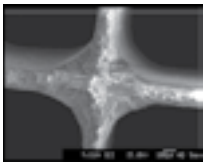
Grants:

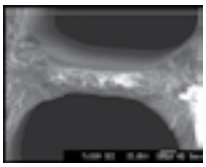
$ 522,624	US Department of Education, "Doctoral Education and Training in Wind Energy at National Wind Energy Center, University of Houston," jointly with S.S. Wang, G. Song and L. Sun, 8/09-8/10
$ 2,378,750	US Department of Energy, "Establishment of a National Wind Energy Center (NWEC)," jointly with S.S. Wang, 11/09-10/10

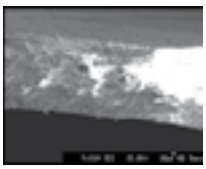
Raymond Flumerfelt











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The research interests of Professor Harold are in the areas of chemical reaction engineering. His groups carry out fundamental experiments complemented by analysis in order to determine mechanistic-based kinetic models, to understand reaction-transport interactions in chemical reactors, and to develop customized reactors for specialized applications. Areas of particular interest focus on environmental and clean energy problems. Ongoing projects include synthesizing and developing new types of nanoporous ceramic and metallic membranes for high temperature gas separations; developing structured catalysts for synthesizing fuels from algal biomass; generating high-purity hydrogen from natural gas and biomass feedstocks; developing integrated catalytic reactors for diesel-exhaust abatement of NOx and particulate soot in the net-oxidizing exhaust of lean-burn gasoline and diesel vehicles.

Michael Harold

Publications:

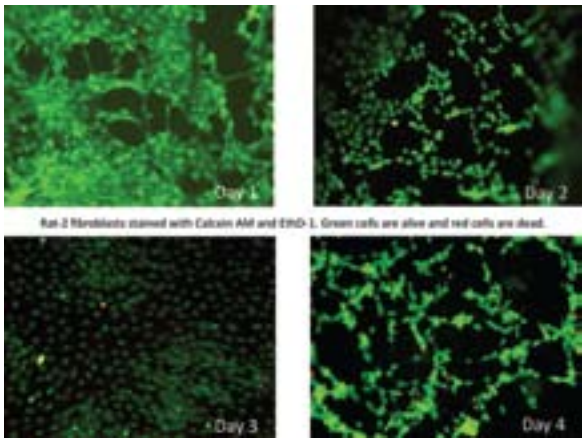
1. Joshi, S.Y., Harold, M.P., Balakotaiah, V., "Overall Mass Transfer Coefficients and Controlling Regimes in Catalytic Monoliths," *Chemical Engineering Science,* (2009) 65 (5), 1729-1747.
2. Kumar, A., Harold, M.P., Balakotaiah, V., "Isotopic Studies of Nox Storage and Reduction on Pt/Bao/Al2o3 Catalyst Using Temporal Analysis of Products," *Journal of Catalysis,* (2009) 270 (2), 214-223.
3. Bhatia, D., Clayton, R. D., Harold, M.P., Balakotaiah, V., "A Global Kinetic Model for Nox Storage and Reduction On Pt/Bao/Al2o3 Monolithic Catalysts," *Catalysis Today,* (2009) 147, S250-S256.
4. Bhatia, D., Harold, M.P., Balakotaiah, V., "Kinetic and Bifurcation Analysis of the Cooxidation of Co And H2 in Catalytic Monolith Reactors," *Chemical Engineering Science,* (2009) 64 (7), 1544-1558.
5. Bhatia, D., McCabe, R.W., Harold, M.P., Balakotaiah, V., "Experimental and Kinetic Study of No Oxidation on Model Pt Catalysts," *Journal of Catalysis,* (2009) 266 (1), 106-119.
6. Clayton, R.D., Harold, M.P., Balakotaiah, V., "Performance Features of Pt/BaO Lean NOx Trap with Hydrogen as Reductant," *AIChE Journal,* (2009) 55 (3), 687-700.
7. Clayton, R.D., Harold, M.P., Balakotaiah, V., Wan, C.Z., "Pt Dispersion Effects During Nox Storage and Reduction on Pt/Bao/Al2o3 Catalysts," *Applied Catalysis B-Environmental,* (2009) 90 (3-4), 662-676.
8. Israni, S.H., Nair, B.K.R., Harold, M.P., "Hydrogen Generation and Purification in a Composite Pd Hollow Fiber Membrane Reactor: Experiments and Modeling," *Catalysis Today,* (2009) 139 (4), 299-311.
9. Joshi, S.Y., Harold, M.P., Balakotaiah, V., "On the Use of Internal Mass Transfer Coefficients in Modeling of Diffusion and Reaction in Catalytic Monoliths," *Chemical Engineering Science,* (2009) 64 (23), 4976-4991.
10. Joshi, S.Y., Harold, M.P., Balakotaiah, V., "Low-Dimensional Models for Real Time Simulations of Catalytic Monoliths," *AIChE Journal,* (2009) 55 (7), 1771-1783.
11. Kumar, A., Medhekar, V., Harold, M.P., Balakotaiah, V., "NO Decomposition and Reduction on Pt/Al2o3 Powder and Monolith Catalysts Using the Tap Reactor," *Applied Catalysis B-Environmental,* (2009) 90 (3-4), 642-651.
12. Xu, J., Harold, M.P., Balakotaiah, V., "Microkinetic Modeling of Steady-State NO/H2/O2 on Pt/BaO/Al2O3 NOx Storage and Reduction Monolith Catalysts," *Applied Catalysis B-Environmental,* (2009) 89 (1-2), 73-86.

GRANTS:

$ 202,752	Baker Petrolite Inc., "High Throughput Screening of Diesel Fuel Additives," jointly with C.W. Rooks and E. Schuler, 5/08-5/09
$ 3,789,726	City of Houston, Texas, "Evaluation and Testing of Emission Control Devices for Diesel Exhaust Abatement," jointly with V. Balakotaiah and J.T. Richardson, 8/02-8/09
$ 10,192,172	Texas Commission on Environmental Quality, "Establishment of the University of Houston Texas Diesel Emission Testing and Research Laboratory," jointly with C.W. Rooks and V. Balakotaiah, 9/07-8/09
$ 60,588	City of Houston, Texas, "Testing of Synthetic Gas-Liquids (GTL) Diesel Fuel and City of Houston Solid Waste Vehicles," jointly with R. Muncrief and C.W. Rooks, 11/09-12/09
$ 715,661	US Department of Energy - National Energy Technology Laboratory, "Kinetic and Performance Studies of the Regeneration Phase of Model Pt/Ba/Rh Nox Traps for Design and Optimization," jointly with V. Balakotaiah, 10/05-5/10
$ 169,596	National Science Foundation, "Collaborative Research: Development of new Heterogeneous Catalysts for Nox Storage and Reduction," Sole PI, 9/07-8/10
$ 85,000	National Science Foundation, "ARRA Equipment Proposal: Multiple Capillary Probe Inlet System for Spatio-Temporal Studies in Multi-Functional Catalytic Reactors," jointly with R. Muncrief, 9/09-8/10
$ 475,750	US Department of Energy - Golden Field Office, "Center for Clean Fuels and Power Generation," jointly with M. Franchek, V. Balakotaiah and K. Grigoriadis, 10/09-10/10
$ 1,421,621	US Environmental Protection Agency, "ARRA - ET University of Houston TECT," jointly with R. Muncrief and C.W. Rooks, 8/09-10/10
$ 1,186,767	US Environmental Protection Agency, "ARRA - ET University of Houston Tinnerman Shadowood," jointly with R. Muncrief and C.W. Rooks, 8/09-10/10
$ 500,000	US Environmental Protection Agency, "Retrofit and In-Use Testing of Ten Nonroad Vehicles with Nett Technologies Blue Max Selective Catalytic Reduction System," jointly with R. Muncrief and C.W. Rooks, 3/09-3/11
$ 2,039,000	Texas Commission on Environmental Quality, "UH SCR Project: Texas Diesel Emission Testing & Research Laboratory -- Testing, Research and Development Phase," jointly with R. Muncrief, C.W. Rooks, and V. Balakotaiah, 5/09-5/11
$ 88,010	Texas Commission on Environmental Quality, "Texas Diesel Emission Testing and Research Laboratory - Testing, Research and Development Phase," jointly with C.W. Rooks, 8/08-5/11
$ 929,147	US Environmental Protection Agency, "Retrofit and In-Use Testing of On-Highway Vehicles with Nett Technologies Blue Max Selective Catalytic Reduction System," jointly with R. Muncrief and C.W. Rooks, 5/10-4/12
$ 598,000	National Science Foundation, "Scholarships for the Accelerated BS/Graduate (Fast Grad) Degree in Engineering," jointly with H. Parsaei, M. Franchek and K. Grigoriadis, 9/07-8/12
$ 2,217,317	US Department of Energy - National Energy Technology Laboratory, "Development of Optimal Catalyst Designs and Operating Strategies for Lean Nox Reduction in coupled LNT-SCR Systems," jointly with V. Balakotaiah and D. Luss, 9/09-9/12

Ramanan Krishnamoorti

Professor Krishnamoorti's research aims to understand the structure-processing-property relations in nano- and micro- structured multiphase soft materials, building on strong collaborations with industry, national laboratories, and academia. With applications ranging from pharmaceutical drug delivery to aerospace materials to improving oil and gas exploration and production, the research focuses on developing fundamental engineering science knowledge and translating those to various applications. The foremost and unique aspect of the research program has been the capability to synthesize well-defined and controlled materials (polymers and inorganic materials) and combine this with well-established measurement techniques to examine fundamental molecular and macroscopic properties that determine and characterize the final properties of soft materials.



Rat-2 fibroblasts stained with Calcein AM and EthD-1. Green cells are alive and red cells are dead.

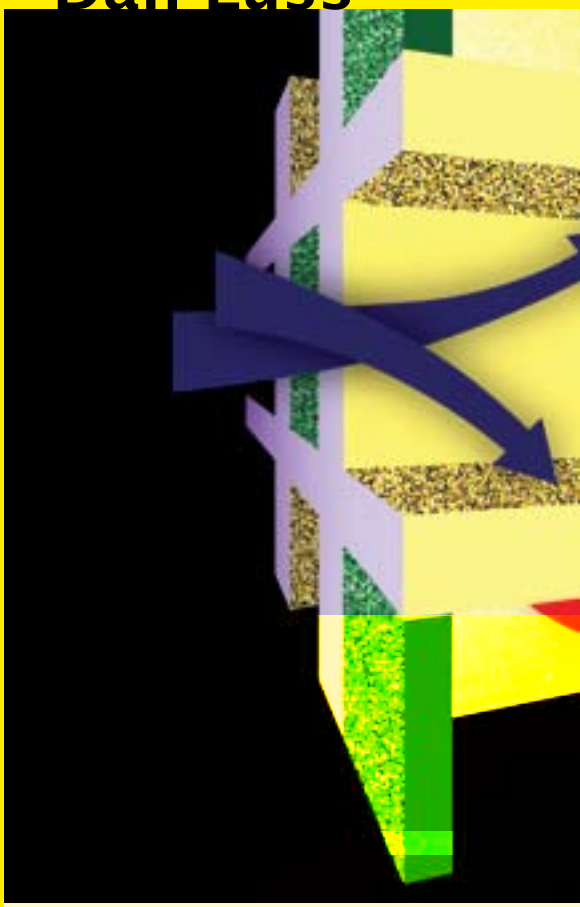
Publications:

1. Ayewah, D.O.O., Davis, D.C., Krishnamoorti, R., Lagoudas, D.C., Sue, H.J., Willson, M., "A Surfactant Dispersed SWCNT-Polystyrene Composite Characterized for Electrical and Mechanical Properties," *Composites Part a-Applied Science and Manufacturing,* (2010) 41 (7), 842-849.
2. Boggara, M.B., Krishnamoorti, R., "Small-Angle Neutron Scattering Studies of Phospholipid-NSAID Adducts," *Langmuir,* (2010) 26 (8), 5734-5745.
3. Boggara, M.B., Krishnamoorti, R., "Partitioning of Nonsteroidal Antiinflammatory Drugs in Lipid Membranes: A Molecular Dynamics Simulation Study," *Biophysical Journal,* (2010) 98 (4), 586-595.
4. Clark, M.D., Krishnamoorti, R., "Dispersion of Functionalized Multiwalled Carbon Nanotubes," *Journal of Physical Chemistry C,* (2009) 113 (49), 20861-20868.
5. Goel, V., Pietrasik, J., Matyjaszewski, K., Krishnamoorti R., "Linear Viscoelasticity of Polymer Tethered Highly Grafted Nanoparticles," *Controlled/Living Radical Polymerization: Progress in ATRP, Eds. K. Matyjaszewski,* ACS, Washington, (2009) 1023, 257 -269.
6. Xu, L., Nakajima, H., Manias, E., Krishnamoorti, R., "Tailored Nanocomposites of Polypropylene with Layered Silicates," *Macromolecules,* (2009) 42 (11), 3795-3803.

Grants:

$ 100,000	Texas Higher Education Coordinating Board - ARP, "Nanocomposite-Based Piezoelectric Actuators and Sensors Without Use of Piezoelectric Materials," jointly with Pradeep Sharma, 5/06-1/09
$ 240,000	Houston Advanced Research Center - HARC, "Light-Weight multifunctional Polymer Nanocomposites," Sole PI, 6/07-8/09
$ 57,140	Itasca Houston Inc., "Petroleum Engineering: Laboratory and International Relations," Sole PI, 11/08-11/09
$ 320,147	Texas A&M Engineering Experiment Station, "Institute for Intelligent Bio-Nano Materials and Structures for Aerospace Vehicles," Sole PI, 8/02-11/09
$ 183,625	Texas Engineering Experiment Station, "Active Nanocomposites: Energy Harvesting and Stress Generation Media for Future Multifunctional Aerospace Structures," Sole PI, 6/06 -11/09
$ 7,500	Shell Oil Company, "Shell - UH Masters Degree in Well Engineering and Masters Degree in Well Completions," Sole PI, 12/09-12/09
$ 150,000	Chevron Energy Technology Company, "Nano-Particle Research for Chemical Enhanced Oil Recovery," jointly with Kishore Mohanty, 6/07-6/10
$ 202,031.5	Stanford Linear Accelerator Center, "Development and Mechanistic characterization of Alloy Fuel Cell Catalysts," Sole PI, 2/10-9/10
$ 50,000	Clarkson Aerospace Corporation, "Nanoclay Reinforced Polyurea for Blast-Resistant Applications," jointly with Valery Khabashesku, 1/10-12/10
$ 25,000	Various Private Profit Agencies, "IIOR Consortium," Sole PI, 1/08-12/10
$ 226,650	Cornell University, "Nanoparticle Resbots," Sole PI, 3/09-4/11
$ 1,218,489	National Science Foundation, "NIRT: Active Electromechanical Nanostructures Without the Use of Piezoelectric Constituents," jointly with Pradeep Sharma, 8/07-7/11
$ 199,988	National Science Foundation, "NUE: Development of the Nanoengineering Minor Option (NEMO) Program at the Collee of Engineering at the University of Houston," jointly with Dmitri Litvinov, Pradeep Sharma, Stuart Long, Hanadi Rifai, Frank Claydon and Maria Modelska, 9/08-8/11
$ 750,000	Cornell University, "Cornell-KAUST Center for Research and Education," Sole PI, 6/08-5/13

Dan Luss



Professor Luss' group is currently conducting research on reaction engineering problems related to environmental emission reduction and synthesis and application of nano-particles. Diesel particulate filters (DPF) are used to reduce the emission of particulate matter (PM) by diesel engines. Local temperature excursions sometimes melt the ceramic catalytic support and destruct the DPF. Our experimental and modeling studies goal is to provide an answer to the still open question what causes sometimes these deleterious temperature excursions and how to circumvent their formation. We conduct experiments on the impact of the spatio-temporal temperature rise on the periodic oxidation-reduction reactions in lean NOx traps and selective catalytic reduction, which are used to reduce the emission of NOx from diesel engine exhaust. We conduct research on the synthesis of various nano-particles and investigate the difference between solid-solid conduct exothermic reactions using micron size powders and those of nano-particles mixtures. Specific interest is the impact of the difference in the reaction rate on the release of pressure waves.

Publications:

1. Chen, K., Martirosyan, K.S., Luss, D., "Wrong-Way Behavior of Soot Combustion in a Planar Diesel Particulate Filter," *Industrial & Engineering Chemistry Research,* (2009) 48 (18), 8451-8456.
2. Chen, K., Martirosyan, K.S., Luss, D., "Soot Combustion Dynamics in a Planar Diesel Particulate Filter," *Industrial & Engineering Chemistry Research,* (2009) 48 (7), 3323-3330.
3. Martirosyan, K.S., Luss, D., "Fabrication of Metal Oxide Nanoparticles by Highly Exothermic Reactions," *Chemical Engineering & Technology,* (2009) 32 (9), 1376-1383.

4. Martirosyan, K.S., Wang, L., Luss, D., "Novel Nanoenergetic System Based on Iodine Pentoxide," *Chemical Physics Letters,* (2009) 483 (1-3), 107-110.

5. Martirosyan, K.S., Wang, L., Vicent, A., Luss, D., "Synthesis and Performance of Bismuth Trioxide Nanoparticles for High Energy Gas Generator Use," *Nanotechnology,* (2009) 20, 82-85.

6. Martirosyan, K.S., Wang, L.Z., Vicent, A., Luss, D., "Nanoenergetic Gas-Generators: Design and Performance," *Propellants Explosives Pyrotechnics,* (2009) 34 (6), 532-538.

7. Martirosyan, K.S., Chen, K., and Luss, D., "Behavior Features of Soot Combustion in Diesel Particulate Filters," *Chem. Eng. Sci.,* (2010) 65, 42-46 .

8. Chen, K., Martirosyan K.S., and Luss, D., "Hot Zones Formation During Regeneration of Diesel Particulate Filters," *AIChE J.,* Accepted for publication (2010).

9. Chen, K., Martirosyan, K.S., and Luss, D., "Temperature Excursions during Soot Combustion in a Diesel Particulate Filter (DPF)," *Ind. Chem. Eng. Res.,* Accepted for publication (2010).

Grants:

$ 250,000 Air Force Research Laboratory, CONTACT Program, "Nanoenergetic gas generator," 11/07-8/10)

$ 46,800 Israel Binational Science Foundation, "Nano size effects in catalytic systems," 10/09-9/13

$ 93,938 Texas Commission on Environmental Quality, "Dr. Dan Luss Project: Texas Diesel Emission Testing and Research Laboratory - Testing, Research and Development Phase," jointly with M.P. Harold, R. Muncrief and C.W. Rooks, 6/09-5/11

221,7317 US Department of Energy - National Energy Technology Laboratory, "Development of Optimal Catalyst Designs and Operating Strategies for Lean Nox Reduction in coupled LNT-SCR Systems," jointly with M.P. Harold and V. Balakotaiah, 9/09-9/12

Michael Nikolaou

Research Interests

Professor Nikolaou's research interests are in computer-aided systems engineering. His work emphasizes the interplay between theory and applications in a number of industries, including chemicals, energy, microelectronics, and biomedical. Prof. Nikolaou's group develops new approaches for broad classes of problems, screens candidate technologies for specific applications, and develops proofs of concept or working prototypes, frequently in collaboration with industrial sponsors. Recent research focuses on development and application of modeling, optimization, and control concepts to industrial emissions control, production and transportation of natural gas, control of hydrocarbon well drilling, and development of antibiotics.

Publications

1. Darby, M.L., Nikolaou. M., "Multivariable System Identification for Integral Controllability," *AUTOMATICA*, (2009) 45(10), 2194-2204.
2. Foster, W. J., Dowla, N., Joshi, S.Y., Nikolaou, M., "The Fluid Mechanics of Scleral Buckling Surgery for the Repair of Retinal Detachment," *Graefes Arch Clin Exp Ophthalmol,* DOI 10.1007/s00417-009-1198-z (2009).
3. Nikolaou, M., Wang, X. and Economides, M.J., "Compressed Natural Gas," *Advanced Natural Gas Engineering,* (2009).
4. Darby, M.L. and Nikolaou, M., "Multivariable System Identification for Integral Controllability – Computational Issues," *ADCHEM* (2009) Istanbul, Turkey, 2009.
5. Darby, M.L., Harmse, M. and Nikolaou, M., "MPC: Current Practice and Challenges," *ADCHEM* (2009) (PLENARY TALK), Istanbul, Turkey, 2009.
6. M. Nikolaou, M. J. Economides, X. Wang, and M. Marongiu-Porcu, "Distributed Compressed Natural Gas Sea Transport" paper OTC-19738-MS, Offshore Technology Conference, Houston, TX 2009.
7. Breyholtz, O., Nygaard, G. and Nikolaou, M., "Advanced Automatic Control for Dual-Gradient Drilling", paper SPE 124631, SPE Annual Technical Conference and Exhibition, New Orleans 2009.
8. Gravdal, J.E., Nikolaou, M., Breyholtz, O. and Carlsen, L.A., "Improved Kick Management During MPD by Real-Time Pore-Pressure Estimation", paper SPE 124054-MS, SPE Annual Technical Conference and Exhibition, New Orleans 2009.
9. Economides, M.J. and Nikolaou, M., "Energy: Facts and Myths," *Kathimerini,* (major Greek daily; in Greek), June 2009.
10. Economides, M.J. and Nikolaou, M., "Greece's Great Opportunity", *Kathimerini,* (major Greek daily; in Greek), April 2009.
11. Nikolaou, M., "Optimizing the Logistics of Compressed Natural Gas Transportation by Marine Vessels," *Journal of Natural Gas Science and Engineering,* in press.
12. Breyholtz, O., Nygaard, G., and Nikolaou, M., "Automatic Control of Managed Pressure Drilling," invited talk, American Control Conference, June 2010.
13. Breyholtz, O., Nygaard, G., Siahaan, H., Nikolaou, M., "Managed Pressure Drilling: A Multi-Level Control Approach," paper SPE 128151, Intelligent Energy, Amsterdam, March 2010.

14. Wang, X., Nikolaou, M., Economides, M.J., "Managing Compressed Natural Gas (CNG) Projects," invited talk, PMIH Conference and Expo, Houston, June 2010.

Grants:

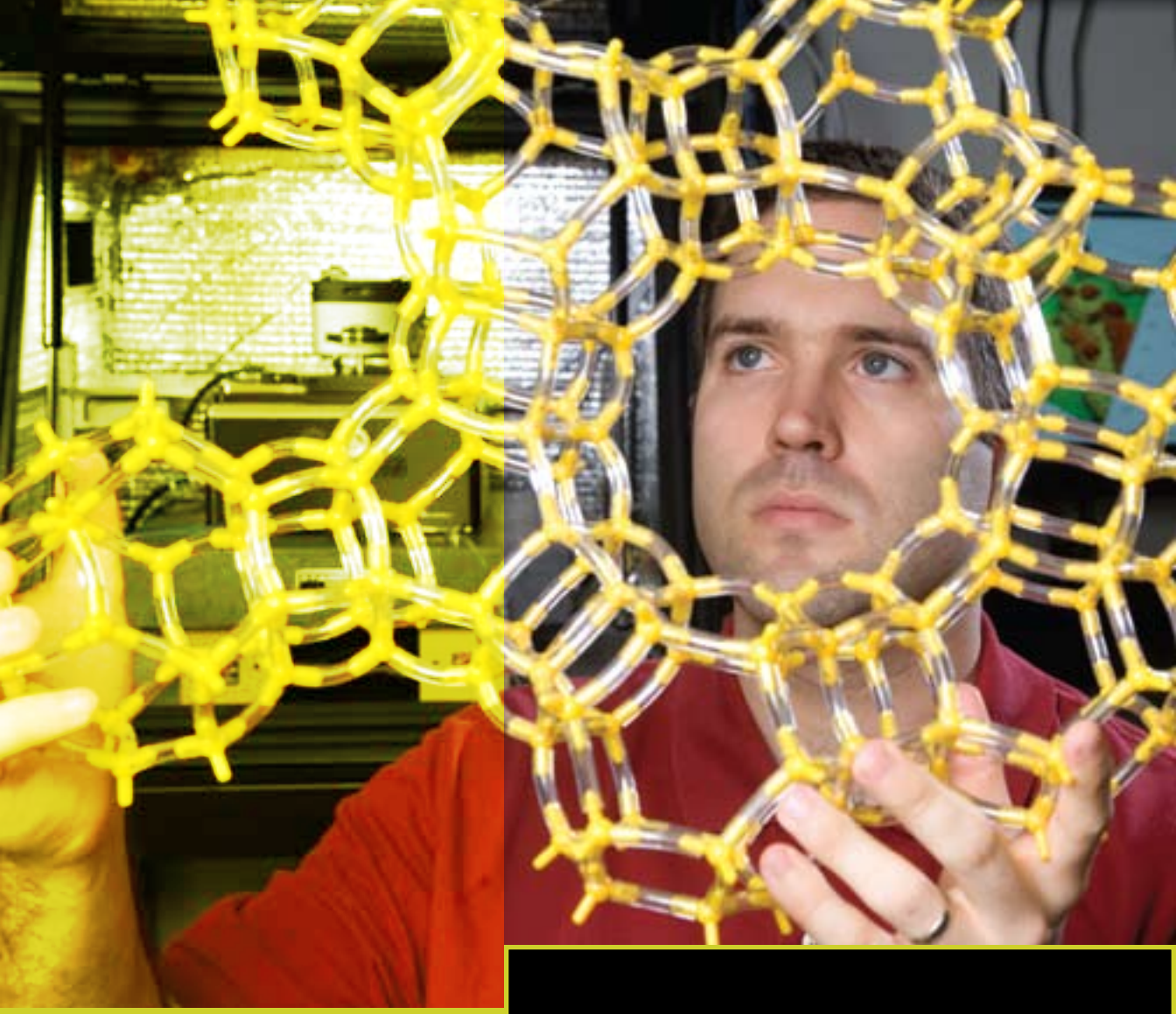
$ 153,660 AstraZeneca Pharmaceuticals, LP, "Mathematical Modeling and Simulation of Microbial Response to Antimicrobial Agents," jointly with V. Tam, 7/07-7/09

$ 124,180 Shell Global Solutions, "Model Predictive Control," Sole PI, 2/08-2/10

$ 219,170 National Science Foundation, "Development & Experimental Testing of a New Approach to Modeling the Effect of antrimicrobial Agents On Heterogeneous Microbial Populations," Sole PI, 1/08-12/10

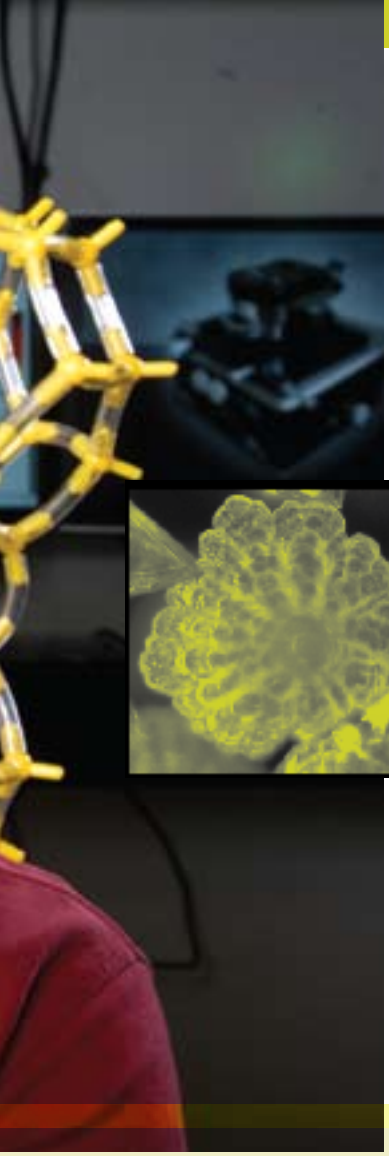
$ 20,385 UH - Residual Funda, "Residual Funds for Michael Nikolaou in Chemical Engineering," Sole PI, 7/02-8/11

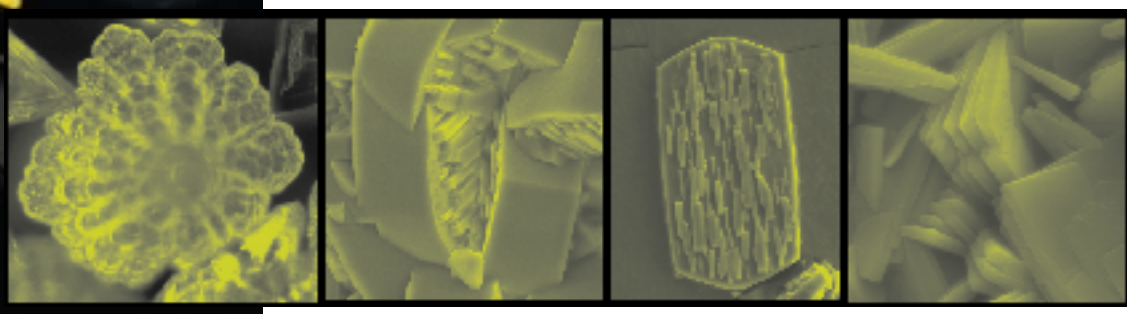
$ 490,000 University of California - Lawrence Berkeley Laborabory, "A Self-Teaching Expert System for the Analysis, Design and Prediction of Gas Production from Shales," Sole PI, 1/09-12/11



Jeff Rimer

Professor Rimer's research interest involves microporous materials synthesis and characterization for catalytic and biomedical applications; pathological biomineralization of kidney stones and vascular calcification; crystal engineering through molecular design; and characterization of nanomaterials self-assembly using x-ray and neutron scattering and scanning probe microscopy.





Publications:

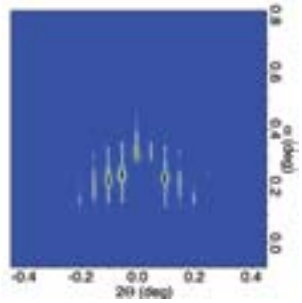
1. Rimer, J.D., An, Z., Zhu, Z., Lee, M.H., Wesson, J.A., Goldfarb, D.S., Ward, M.D., "Crystal Growth Inhibitors for the Prevention of L-Cystine Kidney Stones Through Molecular Design," (Submitted).
2. Pragasam, V., Rimer, J.D., Beshensky, A.M., Zachowicz, W.J., Ward, M.D., Kleinman, J.G., Wesson, J.A., "Calcium Oxalate Monohydrate Aggregation Induced by Aggregation of Desialylated Tamm-Horsfall Protein," *Urol. Res.,* (Accepted).
3. Rimer, J.D., Trofymluk, O., Lobo, R.F., Navrotsky, A., Vlachos, D.G., "Thermodynamics of Silica Nanoparticle Self-Assembly in Basic Solutions of Monovalent Cations," *J. Phys. Chem. C,* (2008) 112, 14754-14761.
4. Rimer, J.D., Trofymluk, O., Navrotsky, A., Lobo, R.F., Vlachos, D.G., "Kinetic and Thermodynamic Studies of Silica Nanoparticle Dissolution," *Chem. Mater.,* (2007) 19, 4189-4197.
5. Rimer, J.D., Roth, D.D., Lobo, R.F., Vlachos, D.G., "Self-Assembly and Phase Behavior of Germanium Oxide Nanoparticles in Basic Aqueous Solutions," *Langmuir,* (2007) 23, 2784-2791.
6. Rimer, J.D., Fedeyko, J.M., Vlachos, D.G., Lobo, R.F., "Silica Self-Assembly and the Synthesis of Microporous and Mesoporous Silicates," *Chem. Eur. J.,* (2006) 12, 2926-2934.
7. Rimer, J.D., Vlachos, D.G., Lobo, R.F., "Evolution of Self-Assembled Silica Tetrapropylammonium Nanoparticles at Elevated Temperatures," *J. Phys. Chem. B,* (2005) 109, 12762-12771.
8. Rimer, J.D., Lobo, R.F., Vlachos, D.G., "Physical Basis for the Formation and Stability of Silica Nanoparticles in Basic Solutions of Monovalent Cations," *Langmuir,* (2005) 21, 8960-8971.
9. Fedeyko, J.M., Rimer, J.D., Lobo, R.F., Vlachos, D.G., "Spontaneous Formation of Silica Nanoparticles in Basic Solutions of Small Tetraalkylammonium Cations," *J. Phys. Chem. B,* (2004) 108, 12271-12275.
10. Kragten, D.D., Fedeyko, J.M., Sawant, K.R., Rimer, J.D., Vlachos, D.G., Lobo, R.F., "Structure of the Silica Phase Extracted from Silica/(TPA)OH Solutions Containing Nanoparticles," *J. Phys. Chem. B,* (2003) 107, 10006-10016.

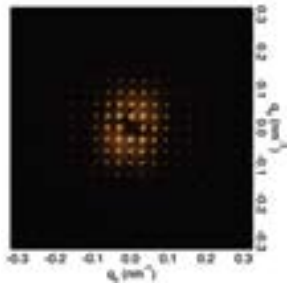
Grants:

$ 6,000 UH - New Faculty Research Program, "Pathological Biomineralization of L-Cystine Kidney Stones," 1/10-8/10

$ 2,980 UH - Small Grants Program, "Optimizing the Activity of Zeolite Nox Reduction Catalyst," 1/10-8/10

$ 25,000 GEAR - UH - Grant to Enhance and Advance Research, "Tailoring Crystallization of the Dimeric Amino Acid L-Cystine Through Molecular Design," 6/10-5/11

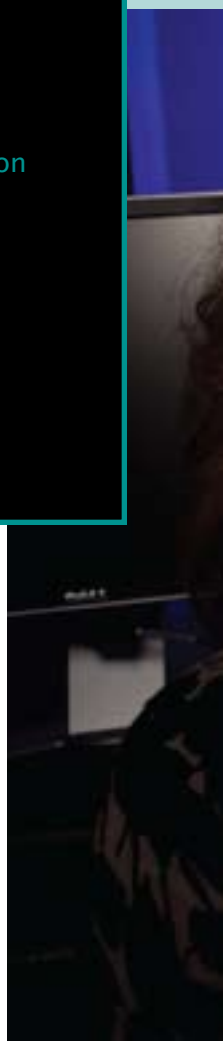




Publications:

1. Mishra, V.; Hur, S. M.; Cochran, E. W.; Stein, G. E.; Fredrickson, G. H.; Kramer, E.J., "Symmetry Transition in Thin Films of Diblock Copolymer/Homopolymer Blends," *Macromolecules,* (2010) 43 (4), 1942-1949.
2. Stein, G.E.; Liddle, J.A.; Aquila, A.L.; Gullikson, E.M., "Measuring the Structure of Epitaxially Assembled Block Copolymer Domains with Soft X-Ray Diffraction," *Macromolecules,* (2009) 43 (1), 433-441.
3. Tang, C.B., J. Bang, G.E. Stein, et al., "Square Packing and Structural Arrangement of ABC Triblock Copolymer Spheres in Thin Films," *Macromolecules,* (2008) 41(12), 4328-4339.
4. Stein, G.E., W.B. Lee, G.H. Fredrickson, et al., "Thickness Dependent Ordering in Laterally Confined Monolayers of Spherical-Domain Block Copolymers," *Macromolecules,* (2007) 40(16), 5791-5800.
5. Bang, J., B.J. Kim, G.E. Stein, et al., "Effect of Humidity on the Ordering of PEO-based Copolymer Thin Films," *Macromolecules,* (2007) 40(19), 7019-7025.
6. Stein, G.E., E.W. Cochran, K. Katsov, et al., "Symmetry Breaking of In-plane Order in Confined Copolymer Mesophases," *Physical Review Letters,* (2007) 98(15).
7. Stein, G.E., E.J. Kramer, X.F. Li, et al., "Layering Transitions in Thin Films of Spherical-domain Block Copolymers," *Macromolecules,* (2007) 40(7), 2453-2460.
8. Stein, G.E., E.J. Kramer, X. Li, et al., "Single-Crystal Diffraction From Two-Dimensional Block Copolymer Arrays," *Physical Review Letters,* (2007) 98(8).
9. Khanna, V., E.W. Cochran, A. Hexemer, et al., "Effect of Chain Architecture and Surface Energies on the Ordering Behavior of Lamellar and Cylinder Forming Block Copolymers," *Macromolecules,* (2006) 39(26), 9346-9356.

Professor Stein's research is focused on the physics of polymer thin films, emphasizing challenges associated with polymeric electronic materials. Specific areas of interest include radiation-sensitive materials for next-generation lithography, reaction-diffusion mechanisms in thin polymer films, spontaneous pattern formation through self-assembly, dynamics at interfaces, diffusion in cross-linked networks, radiation-induced cross-linking reactions, and nanostructured organic photovoltaic devices.



Gila Stein

10. Hexemer, A., G.E. Stein, E.J. Kramer, et al., "Block Copolymer Monolayer Structure Measured with Scanning Force Microscopy Moire Patterns," *Macromolecules,* (2005) 38(16), 7083-7089.

Grants:

$ 20,000 TcSUH, "Interdigitated Heterojunction Solar Cells from Conjugated Polymers," 8/09-7/10

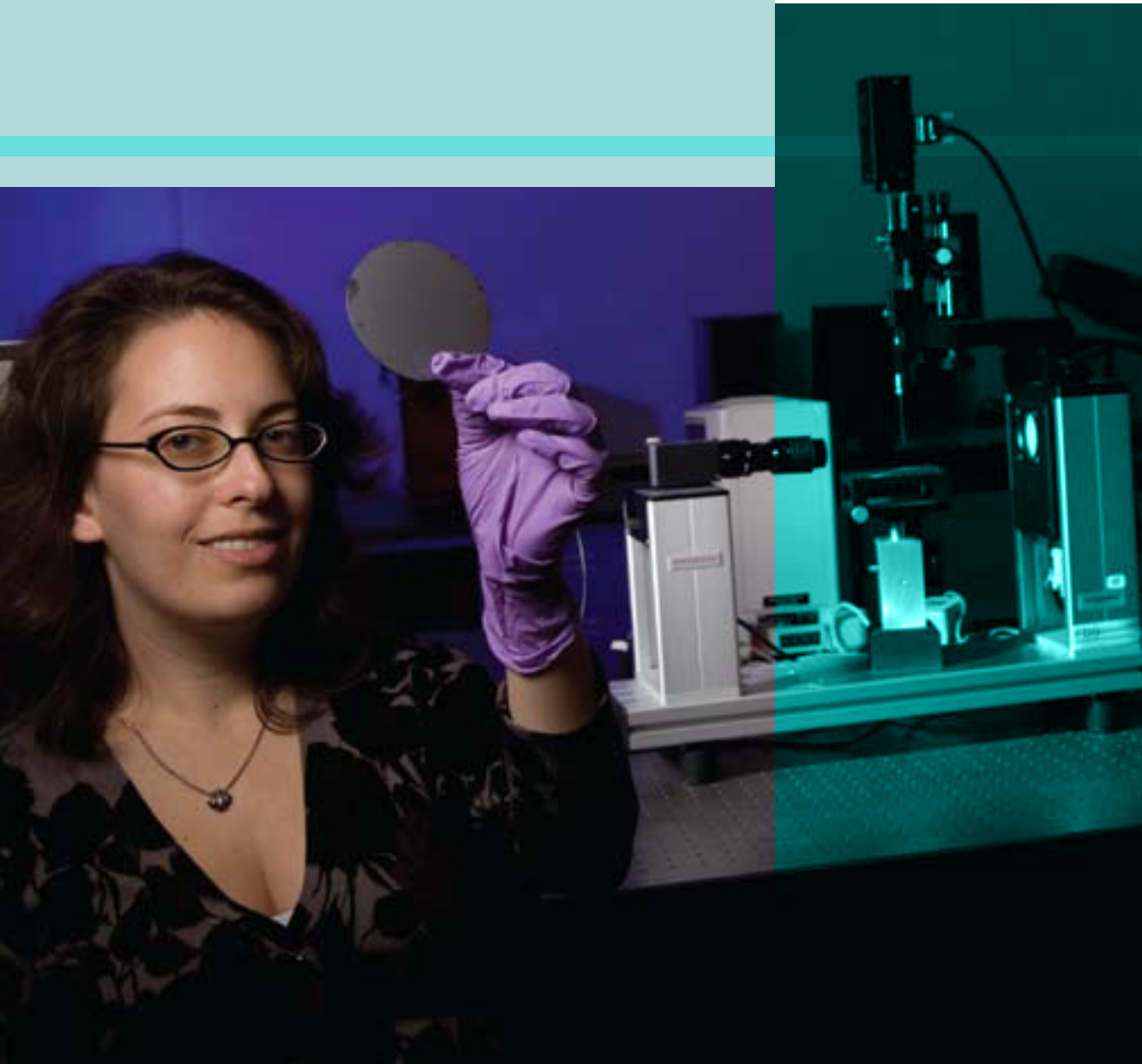
$ 25,000 GEAR - UH - Grant to Enhance and Advance Research, "Measuring the Latent Image in Chemically Amplified resists with X-Ray Diffraction," 6/09-8/10

$ 3,000 UH - Small Grants Program, "Polymer Kinetics in Solution-Cast Thin Films," 1/10-8/10

$ 175,000 National Science Foundation, "ARRA- BRIDGE: Measurements of Image Formation in Chemically-Amplified Resists"

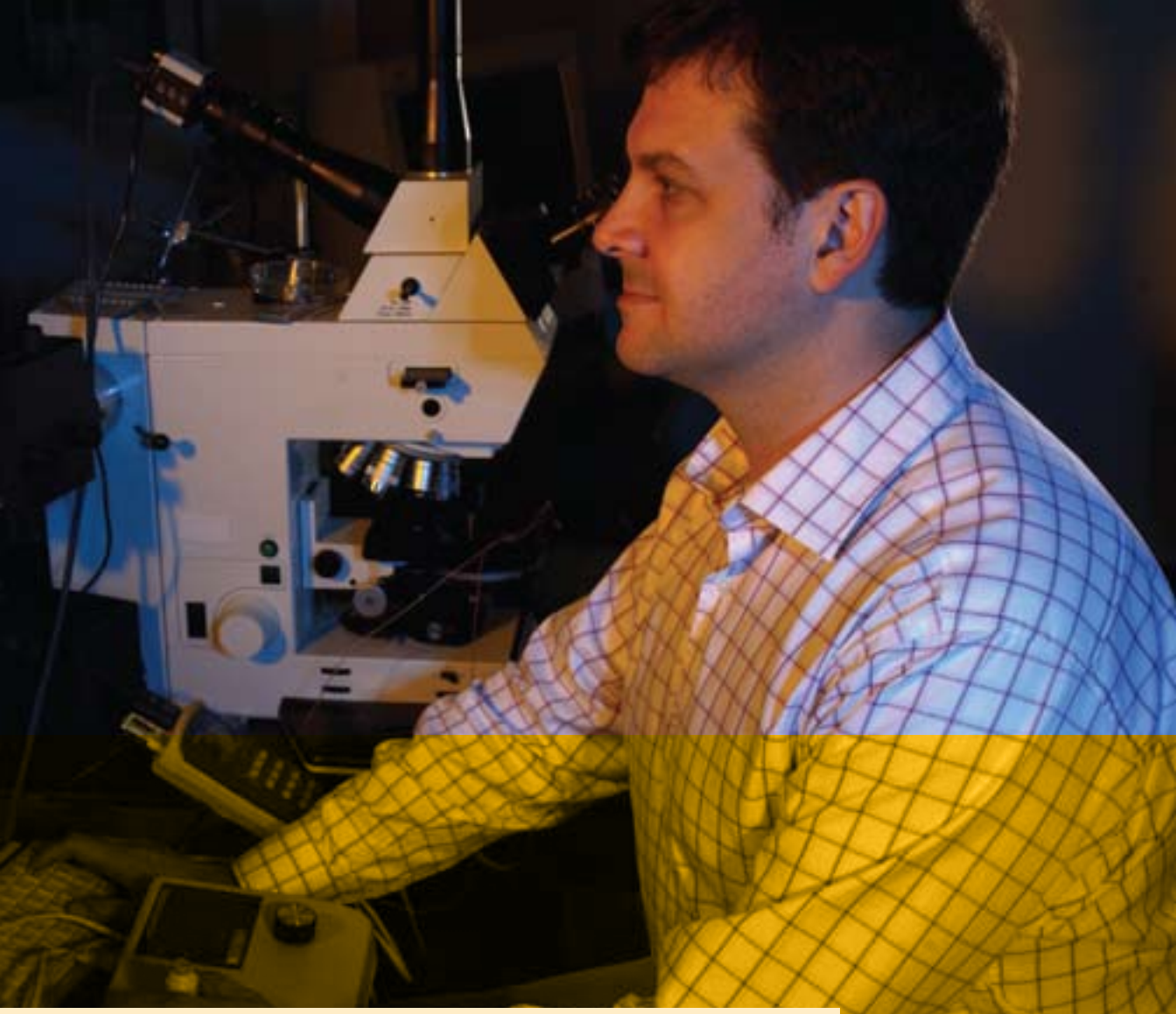
$ 800,000 National Science Foundation, "ARRA - MRI-R2 Consortium: Acquisition of an Electron Beam Lithography System to Support Transformative Device and Materials Research in the Greater Houston Area," jointly with D. Economou, P. Ruchhoeft, D. Litvinov and V. Donnelly, 3/10-2/12

$ 331,590 National Science Foundation, "REU Site: Innovations in Technology at the University of Houston," jointly with F. Claydon and S. Long, 5/10-4/13



Professor Vekilov carries out pioneering research in biomolecular engineering, with a focus on phase transitions occurring in solutions of biological macromolecules. Application areas include protein-condensation diseases, structural biology, and bio-based nanotechnology. His current research interests include: protein crystallization; physico-chemical aspects of sickle-cell anemia; crystallization tools for structural genomics; nucleation and phase transitions in protein solutions; protein intermolecular interactions and phase diagrams; criteria for the impact of reduced gravity on protein-crystal perfection; and kinetics and stability of crystal growth.

Peter Vekilov



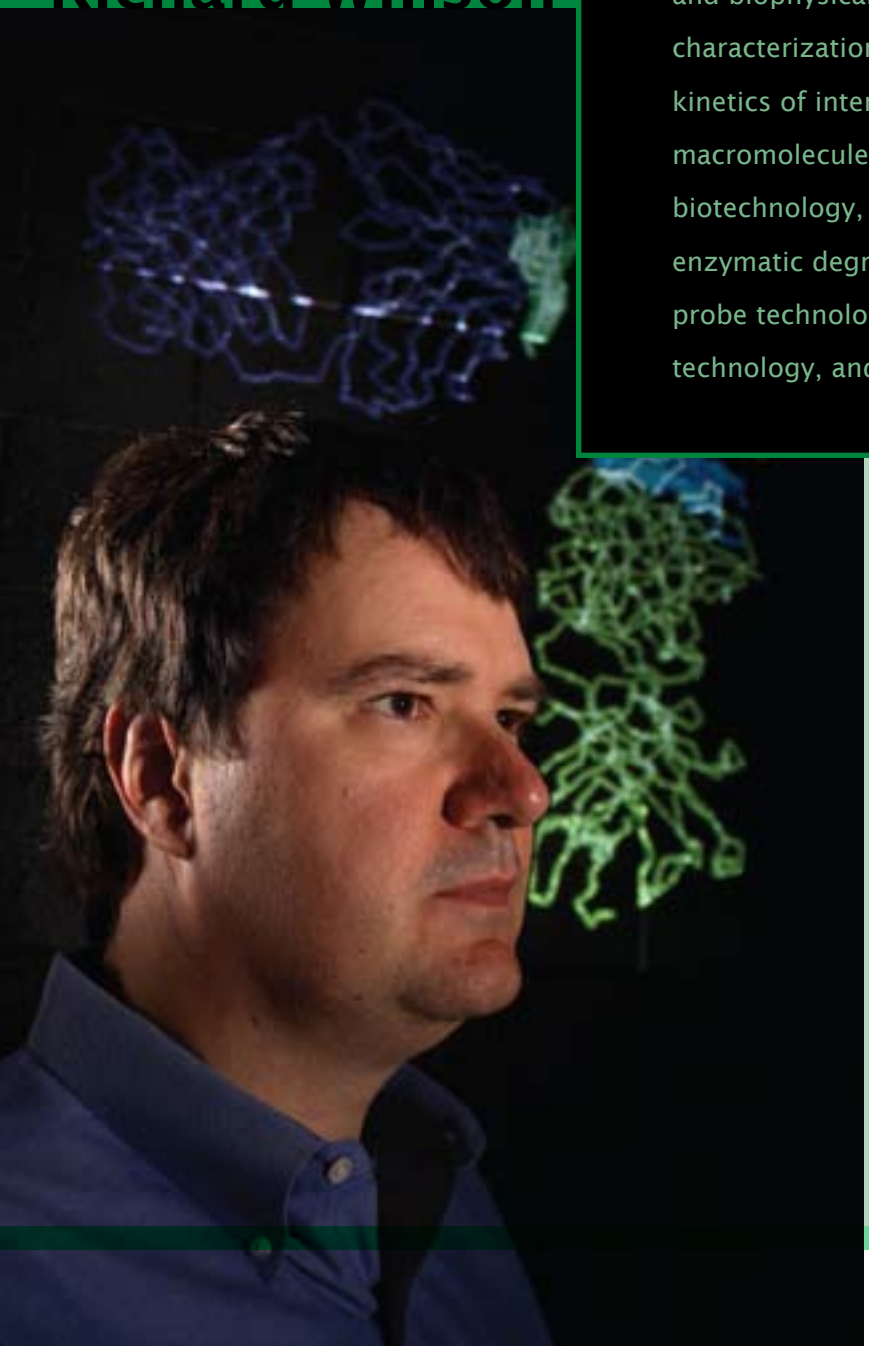
Publications:

1. Qutub, Y., Uzunova, V., Galkin, O., Vekilov, P.G., "Interactions of Hemin with Model Erythrocyte Membranes," *Journal of Physical Chemistry B,* (2010) 114 (13), 4529-4535.
2. Maruyama, M., Tsukamoto, K., Sazaki, G., Nishimura, Y., Vekilov, P.G., "Chiral and Achiral Mechanisms of Regulation of Calcite Crystallization," *Crystal Growth & Design,* (2009) 9 (1), 127-135.
3. Pan, W.C., Filobelo, L., Pham, N. D.Q., Galkin, O., Uzunova, V.V., Vekilov, P.G., "Viscoelasticity in Homogeneous Protein Solutions," *Physical Review Letters,* (2009) 102 (5).
4. Pan, W.C., Uzunova, V.V., Vekilov, P.G., "Free Heme in Micromolar Amounts Enhances the Attraction Between Sickle Cell Hemoglobin Molecules," *Biopolymers,* (2009) 91 (12), 1108-1116.
5. Shah, M., Galkin, O., Vekilov, P.G., "Localized Generation of Attoliter Protein Solution Droplets by Electrofocused Liquid-Liquid Separation," *Journal of Physical Chemistry B,* (2009) 113 (20), 7340-7346.
6. Vekilov, P.G., "Metastable Mesoscopic Phases in Concentrated Protein Solutions," *In Interdisciplinary Transport Phenomena: Fluid, Thermal, Biological, Materials, and Space Sciences,* Sadhal, S.S., Ed. (2009) Vol. 1161, pp 377-386.

Grants:

$ 150,000	The Welch Foundation, "Water Structuring & Molecular Recognition During Protein Assembly," Sole PI, 6/08-5/09
$ 5,563	National Science Foundation, "Supplement: Mesoscopic Aggregation of Folded Proteins," jointly with V. Lubchenko, 2/09-1/10
$ 295,563	National Science Foundation, "Mesoscopic Aggregation of Folded Proteins," jointly with V. Lubchenko, 2/09-1/12
$ 197,220	Texas Higher Education Coordinating Board - ARP, "Does Free Heme Enhance the Polymerization of Sickle Cell Hemoglobin?," Sole PI, 7/10-8/12

Richard Willson



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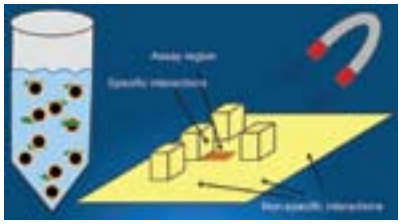
The major research interests of Professor Willson lie at the interface between the life sciences and engineering, and range from fairly basic investigations of fundamental phenomena to development of novel technologies. Specific areas: molecular recognition and adsorption, including separations of proteins and nucleic acids for purification and analysis, antibody and aptamer affinity and selectivity, and biophysical and structure/function characterization of driving forces and kinetics of interactions involving biological macromolecules; and environmental biotechnology, including microbial and enzymatic degradation of wastes, DNA probe technology, ribosomal RNA technology, and combinatorial methods.



Publications:

1. Anez-Lingerfelt, M., Fox, G.E., Willson, R.C., "Reduction of DNA Contamination in RNA Samples for Reverse Transcription-Polymerase Chain Reaction Using Selective Precipitation by Compaction Agents," *Analytical Biochemistry,* (2009) 384 (1), 79-85.
2. Mohan, S., Kourentzi, K., Schick, K.A., Uehara, C., Lipschultz, C.A., Acchione, M., DeSantis, M.E., Smith-Gill, S.J., Willson, R.C., "Association Energetics of Cross-Reactive and Specific Antibodies," *Biochemistry,* (2009) 48 (6), 1390-1398.
3. Potty, A.S.R., Kourentzi, K., Fang, H., Jackson, G.W., Zhang, X., Legge, G.B., Willson, R.C., "Biophysical Characterization of DNA Aptamer Interactions with Vascular Endothelial Growth Factor," *Biopolymers,* (2009) 91 (2), 145-156.
4. Zhang, X., Potty, A.S.R., Jackson, G.W., Stepanov, V., Tang, A., Liu, Y., Kourentzi, K., Strych, U., Fox, G.E., Willson, R.C., "Engineered 5S Ribosomal RNAs Displaying Aptamers Recognizing Vascular Endothelial Growth Factor and Malachite Green," Journal of Molecular Recognition, (2009) 22 (2), 154-161.
5. Zuo, G., Roberts, D.J., Lehman, S.G., Jackson, G.W., Fox, G.E., Willson, R.C., "Molecular Assessment of Salt-Tolerant, Perchlorate- and Nitrate-Reducing Microbial Cultures," *Water Science and Technology,* (2009) 60 (7), 1745-1756.

Grants:

$ 18,260 BioTex, Inc., "Temperature Gradient Hybridizer and Real-Time Imager for DNA Microarrays," Sole PI, 2/08-1/09

$ 92,692 University of Texas Medical Branch at Galveston, "Towards the Development of a Syndrome-Specific Diagnostic Tool," jointly with P. Ruchhoeft, 3/08-2/09

$ 122,256 National Science Foundation, "Noninvasive Optical Sensing of Micro-Retroreflectors in Turbid Media and Skin," jointly with P. Ruchhoeft and K. Larin, 5/09-4/10

$ 62,500 University of Texas Health Science Center at Houston, "Engineered Gold Nanoparticles for the Detection of Solid Cancers: Investigation of Shape-Dependent Biological Dynamics," jointly with P. Ruchhoeft, 9/09-9/10

$ 60,000 University of British Columbia, "Fabrication and Suspension of Biologically Active Micro-Retroreflectors," jointly with P. Rucchoeft, 10/08-10/10

$ 1,129,663 US Department of Homeland Security, "Bioinformatics Approach and Assay Development for the Estimation of the Total Genomic Diversity of Complex Brackground:Phase II," jointly with Y. Fofanov and S.L. Johnsson, 2/10-1/11

$ 26,160 University of Texas Medical Branch at Galveston, "WRCE Diagnostics Development Core," Sole PI, 3/10-2/11

$ 39,244 BioTex, Inc., "SBIR Phase 2: Rapid Microbial Identification by MALDI_TOF Mass Spectrometry of Ribosomal RNA," jointly with G.E. Fox, 3/09-2/11

$ 39,244 BioTex, Inc., "SBIR Phase 2: Rapid Microbial Identification by MALDI_TOF Mass Spectrometry of Ribosomal RNA," jointly with G.E. Fox, 3/09-2/11

$ 50,000 The Welch Foundation, "Physical Chemistry of Biomolecular Recognition," Sole PI, 6/09-5/11

$ 50,000 The Welch Foundation, "Physical Chemistry of Biomolecular Recognition," Sole PI, 6/10-5/11

$ 621,463 NIH/National Center for Research Resources, "ARRA - Single Molecule Nanomagnetic Assays for Ultrasmall Sample Clinical Diagnostics," jointly with D. Litvinov and T.R. Lee, 9/09-8/11

$ 100,000 NIH/National Center for Research Resources, "ARRA - Single Molecule Nanomagnetic Assays for Ultrasmall Sample Clinical Diagnostics," jointly with D. Litvinov and T.R. Lee, 9/09-8/11

$ 240,405 NIH/National Center for Research Resources, "ARRA - Single Molecule Nanomagnetic Assays for Ultrasmall Sample Clinical Diagnostics," jointly with D. Litvinov and T.R. Lee, 9/09-8/11

$ 247,745 National Science Foundation, "Noninvasive Optical Sensing of Micro-Retroflectors in Turbid Media and Skin," jointly with P. Ruchhoeft and K. Larin, 5/10-4/12

$ 235,207 National Science Foundation, "Single-biomolecule Detector Array Based on Nanomagnetically Stabilized Magnetoreristive Sensors," jointly with D. Litvinov, 9/09-8/12

$ 64,790 National Science Foundation, "Single-biomolecule Detector Array Based on Nanomagnetically Stabilized Magnetoreristive Sensors," jointly with D. Litvinov, 9/09-8/12

$ 38,224 University of Texas Medical Branch at Galveston, "WRCE Diagnostics Development Core," Sole PI, 4/09-2/14

$ 29,800 University of Texas Medical Branch at Galveston, "Towards the Development of a Syndrome-Specific Diagnostic Tool," jointly with P. Ruchhoeft, 3/10-2/14

$ 159,497 University of Texas Medical Branch at Galveston, "Towards the Development of a Syndrome-Specific Diagnostic Tool," jointly with P. Ruchhoeft, 4/09-2/14

$ 150,603 University of Texas Medical Branch at Galveston, "Towards the Development of a Syndrome-Specific Diagnostic Tool," jointly with P. Ruchhoeft, 3/10-2/14

$ 184,337 University of Texas Medical Branch at Galveston, "Towards the Development of a Syndrome-Specific Diagnostic Tool," jointly with P. Ruchhoeft, 3/10-2/14

Associated Faculty

Rigoberto Advincula

Professor Advincula's group focuses on the design, synthesis, and characterization of nanostructured materials capable of controlled-assembly, tethering, and self-organization in ultrathin films. This includes functional macromolecules, polymerization on surfaces, electropolymerization, and preparation of nanoparticles and hybrid materials that are electrical conducting, photoluminescent, electroluminescent, energy harvesting, optically active, and biocompatible. Surface sensitive spectroscopy and microscopy is systematically utilized to probe materials properties and biological phenomena. This group is also involved in investigating nanoparticles, nanostructured surfaces, and nanocomposite materials for sensor and bioapplications.

Publications:

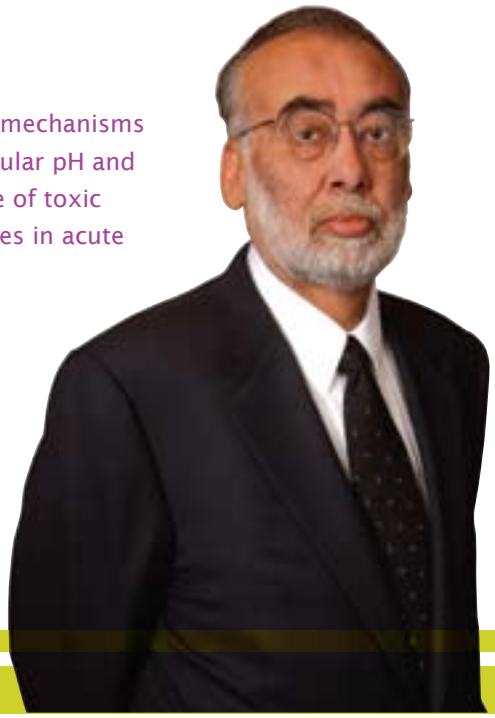
1. Reznik, C., Estillore, N., Advincula, R., Landes, C., "Single Molecule Spectroscopy Reveals Heterogeneous Transport Mechanisms for Molecular Ions in a Polyelectrolyte Polymer Brush," *J. Phys. Chem. B.,* (2009) 113, 14611-14618.
2. Duran, H., Ogura, K., Nakao, K., Vianna, S.,Usui, H., Advincula, R., Knoll, W., "High-Vacuum Vapor Deposition and in Situ Monitoring of N-Carboxy Anhydride Benzyl Glutamate Polymerization," *Langmuir,* (2009) 25, 10711-10718.
3. Fujie, T., Park, J., Murata, A., Estillore, N., Tria, M., Takeoka, S., Advincula, R., "Hydrodynamic Transformation of a Freestanding Polymer Nanosheet Induced by a Thermoresponsive Surface," *ACS App. Mat. Inter.,* (2009) 1, 1404-1413.
4. Obeid, R., Park, J., Advincula, R., Winnik, F., "Temperature-dependent interfacial properties of hydrophobically end-modified poly (2-isopropyl-2-oxazoline)s assemblies at the air/water interface and on solid substrates," *J. Col. Interf. Sci.,* (2009) 340, 142-152.
5. Wang, W., Zhang, S., Chinwangso, P., Advincula, R., Lee, T.R., "Electric Potential Stability and Ionic Permeability of SAMs on Gold Derived from Bidentate and Tridentate Chelating Alkanethiol," *J. Phys. Chem.,* (2009) 113, 3717-3725.
6. Park, J., Liu, M., Mays, J., Dadmun, M., Advincula, R., "Nano-donuts from pH-dependent block restructuring in amphiphilic ABA triblock copolymer vesicles at the air-water interface," *Soft Matter,* (2009) 5, 747-749.
7. Park, J., Ponnapati, R., Taranekar, P., Advicnua, R., "Carbazole Peripheral Poly(benzyl ether) Dendrimers at the Air–Water Interface: Electrochemical Cross-Linking and Electronanopatterning," *Langmuir,* (2009) Invited Feature Article.

Grants:

$	75,000	PPG-Sierracin, "Anti-static Aerospace Transparencies," 6/08-6/09
$	90,000	ACS- PRF Type AC Grant (45853-AC7), "Electropolymerizable Dendrons in RAFT Polymerizations," 1/07-6/09
$	150,000	Robert A. Welch Foundation (E-1551) - continuation, "Synthesis and Properties of Dendrimeric and Hyperbranched Conjugated Polymers Tethered to Nanoparticles and Surfaces," 6/06-6/09
$	75,000	Alliance for Nanohealth of Texas, "Nanotherapeutics to Enhance Wound Healing," 3/07-5/08
$	432,047	National Science Foundation (DMR-06-02896) and Science and Engineering Research Council (SERC), Singapore, "Materials World Network: Multifunctional Nanostructured Nanoparticle-Conjugated Polymer Assemblies Prepared via Layer-by-Layer and Surface Initiated Polymerization (SIP) Approaches," co-funded with S. Valiyaveettil, 6/06-11/09

Akhil Bidani

Professor Bidani's research interests include mechanisms and kinetics of microvascular gas and ion transport; intracellular pH and its regulation in lung cells; mechanisms of pulmonary uptake of toxic reactive gases; pathophysiology of lung function abnormalities in acute lung injury and ARDS; physiology of cardiopulmonary support; and mathematical modeling of cellular transport processes.



Publications:

1. Benedik, P.S., Baun, M.M., Keus, L., Jimenez, C., Morice, R., Bidani, A., Meininger, J.C., "Effects of Body Position on Resting Lung Volume in Overweight and Mildly to Moderately Obese Subjects," Respiratory Care, (2009) 54 (3), 334-339.

Stanko Brankovic

Professor Brankovic's research interest is in the general area of electrochemistry and electrochemical nanofabrication and nanomaterial synthesis. The specific focus is monolayer catalyst design for fuel cells and biomolecular devices, sensors, magnetic materials and nanostructures and surface morphology evolution during nonequillibrium deposition/erosion processes. His research opus complements the research of several Chemical & Biomolecular Engineering faculty members, opening up opportunities for collaboration.

Publications:

1. Brankovic, S.R., Vasiljevic, N., Dimitrov, N., "Chapter 27- Applications to Magnetic Recording and Microelectronic Technologies," *Modern Electroplating V,* editors: M. Paunovic and M. Schlesinger, John Willey and Sons, Inc (2010). (PDF)
2. Brankovic, S.R., "Chapter 11 - Electrodeposition - Fundamental Aspects and Methods," *Functional Properties of Bioinspired Surfaces - Characterizations and Technological Applications,* editors: N.O. Fuentes and E.A. Favret, World Scientific. (2009). (PDF)
3. Brankovic, S.R., George, J., Bae, S.E., Litvinov, D., "Critical Parameters of Solution Design for Electrodeposition of Soft 2.4T CoFe Alloys," *Electrochemical Society Transactions,* (2009) 16 (45), 75-87. (PDF)

James Briggs

The research performed by Professor Briggs (primary appointment with Biology and Biochemistry) focuses on computational studies of protein structure and function, inhibitor design, investigations of possible drug-resistance pathways, and development of methods for the above work. Targets for these studies include those important in the treatment of AIDS, cancer, tuberculosis, biowarfare defense, biofilm prevention, and others.

Publications:

1. Xie, F.Q., Briggs, J.M., Dupureur, C.M., "Nucleophile Activation in PD (D/E)xK Metallonucleases: An Experimental and Computational pK(a) Study," *Journal of Inorganic Biochemistry,* (2010) 104 (6), 665-672.
2. Joshi, M., Ebalunode, J.O., Briggs, J.M., "Computational Insights Into the Interaction of the Anthrax Lethal Factor With the N-Terminal Region of its Substrates," *Proteins-Structure Function and Bioinformatics,* (2009) 75 (2), 323-335.
3. Mandal, P.K., Limbrick, D., Coleman, D.R., Dyer, G.A., Ren, Z.Y., Birtwistle, J.S., Xiong, C.Y., Chen, X.M., Briggs, J.M., McMurray, J.S., "Conformationally Constrained Peptidomimetic Inhibitors of Signal Transducer and Activator of Transcription 3: Evaluation and Molecular Modeling," *Journal of Medicinal Chemistry,* (2009) 52 (8), 2429-2442.

Shankar Chellam

Professor Chellam (primary appointment with Civil and Environmental Engineering) focuses on experimental studies of colloidal and bacterial fouling of membranes, nanofiltration mechanisms of organic contaminants and electrolytes, hindered transport of viruses and bacteria through microfiltration membranes, virus interactions with manufactured nanomaterials such as fullerol, and development of microwave digestion and ICP-MS methods for quantifying trace metals in aerosols to identify industrial sources of air pollution.

Publications:

1. Badireddy, A.R., Chellam, S., Gassman, P.L., Engelhard, M.H., Lea, A.S., Rosso, K.M., "Role of Extracellular Polymeric Substances in Bioflocculation of Activated Sludge Microorganisms under Glucose-controlled Conditions," *Water Research,* In Press (2010) (doi:10.1016/j.watres.2010.06.024).
2. Kulkarni, P., Chellam, S., "Disinfection By-Product Formation Following Chlorination of Drinking Water: Artificial Neural Network Models and Changes in Speciation with Treatment," *Science of the Total Environment,* In Press (2010). (doi:10.1016/j.scitotenv.2010.05.040).
3. Altunkaynak, A., Chellam, S., "Prediction of Specific Permeate Flux during Crossflow Microfiltration of Polydispersed Colloidal Suspensions by Fuzzy Logic Models," *Desalination,* (2010) 253 188-194.
4. Cogan, N.G., Chellam, S., "Incorporating Pore Blocking, Cake Filtration, and EPS Production in a Model for Constant Pressure Bacterial Fouling During Dead-end Microfiltration," *Journal of Membrane Science,* (2009) 345 (1-2) 81-89.
5. Badireddy, A.R., Hotze, E.M., Chellam, S., Wiesner, M.R., "Mechanisms of Bacteriophage Inactivation via Singlet Oxygen Generation in UV Illuminated Fullerol Suspensions," *Environmental Science and Technology,* (2009) 43 (17) 6639-6645.
6. Baltus, R., Badireddy, A.R., Xu, W., Chellam, S., "Analysis of Configurational Effects on Hindered Convection of Nonspherical Bacteria and Viruses across Microfiltration Membranes," *Industrial & Engineering Chemistry Research,* (2009) 48 (5) 2404-2413.
7. Kulkarni, P., Chellam, S., Fraser, M.P., "Response to Comment on "Tracking Petroleum Refinery Emission Events Using Lanthanum and Lanthanides as Elemental Markers for PM2.5," *Environmental Science and Technology,* (2009) 43 (8), 2990-2991.

Michael Economides

Professor Economides' research efforts involve the optimization of the overall hydrocarbon production system from the reservoir, the wellbore and to the market. He has greatly contributed to on reservoir stimulation theory, advanced reservoir exploitation strategies and complex well architecture design features. He is currently conducting industry efforts for driving deep offshore technology development, world energy scenario forecast and natural gas development. Next generation technology of oil and gas industry involves the development of advanced computer-aided tools.

Publications:

1. Ehlig-Economides, C., Economides, M.J., "Sequestering Carbon Dioxide in a Closed Underground Volume," *Journal of Petroleum Science and Engineering,* (2010) 70 (1-2), 118-125.
2. Economides, M. J., Xie, X.N., "Climate Change — What Does the Research Mean?" *Chemical Engineering Progress,* (2009) 105 (6), 20-25.

George Fox

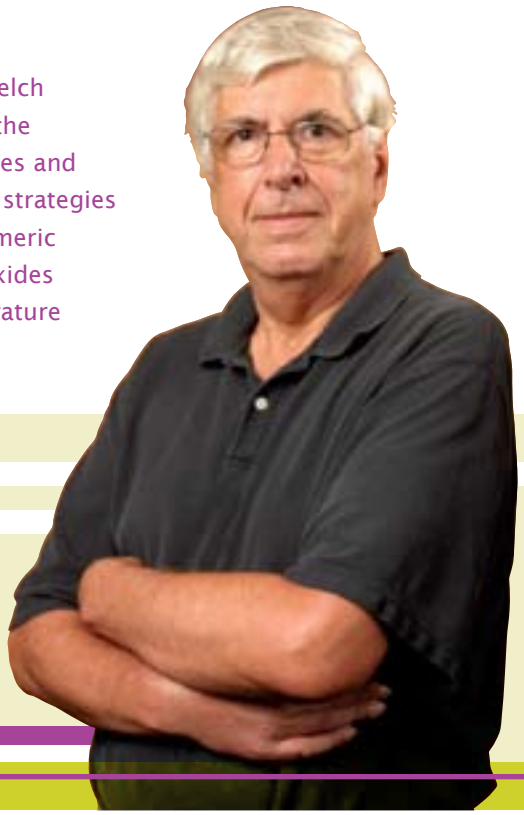
The laboratory of Professor Fox conducts ongoing basic research efforts to understand the structure, function, and evolution of RNA. These studies utilize tools of bioinformatics and molecular biology. When needed, atomic-resolution RNA structures are determined by high-resolution structure studies by NMR. Of special interest are the ribosomal RNAs of the protein-synthesis machinery whose sequences and structures are providing insight into the early evolution of life. Applied research derives from the core RNA research and focuses on the use of RNA in various applications. These include the development of monitoring methods for the rapid detection and identification of bacteria in both space and biodefense applications; the development, production, and use of artificial RNAs; and the monitoring of bacteria during bioremediation.

Publications:

1. Anez-Lingerfelt, M., Fox, G.E., Willson, R.C., "Reduction of DNA Contamination in RNA Samples for Reverse Transcription-polymerase Chain Reaction Using Selective Precipitation by Compaction Agents," *Analytical Biochemistry,* (2009) 384 (1), 79-85.
2. Fox, G., "Early History of the Translation Machinery," *Origins of Life and Evolution of Biospheres,* (2009) 39 (3-4), 203-204.
3. Rastogi, R., Wu, M., DasGupta, I., Fox, G.E., "Visualization of Ribosomal RNA Operon Copy Number Distribution," *BMC Microbiology,* (2009) 9.
4. Warmflash, D., Chu, H.Y., Siefert, J., Fox, G.E., "Life Detection Using Glucose and Tetrasaccharide Enantiomer Pairs," *Astrobiology,* (2009) 9 (3), 297-303.
5. Zhang, X., Potty, A.S.R., Jackson, G.W., Stepanov, V., Tang, A., Liu, Y., Kourentzi, K., Strych, U., Fox, G.E., Willson, R.C., "Engineered 5S Ribosomal RNAs Displaying Aptamers Recognizing Vascular Endothelial Growth Factor and Malachite Green," *Journal of Molecular Recognition,* (2009) 22 (2), 154-161.
6. Zhang, Z.D., Nayar, M., Ammons, D., Rampersad, J., Fox, G.E., "Rapid in Vivo Exploration of a 5S rRNA Neutral Network," *Journal of Microbiological Methods,* (2009) 76 (2), 181-187.
7. Zuo, G., Roberts, D.J., Lehman, S.G., Jackson, G.W., Fox, G.E., Willson, R.C., "Molecular Assessment of Salt-tolerant, Perchlorate- and Nitrate-reducing Microbial Cultures," *Water Science and Technology,* (2009) 60 (7), 1745-1756.
8. Fox, G.E.. "Origin and Evolution of the Ribosome." *Cold Spring Harb Perspect Biol.,* June 9. [Epub ahead of print].

Allan Jacobson

Professor Jacobson, the Robert A. Welch Professor of Science at UH, conducts research on the synthesis and properties of transition metal silicates and hybrid metal-oxide-organic frameworks; synthetic strategies for the synthesis of homochiral solids for enantiomeric separations; growth of nano particles in porous oxides and metal oxides with applications in high temperature ionic devices, such as fuel cells, oxygen transport membranes and sensors.



Publications:

1. Jacobson, A.J., "Materials for Solid Oxide Fuel Cells," *Chemistry of Materials,* (2010) 22 (3), 660-674.
2. Kim, I.H., Wang, X.Q., Jacobson, A.J., "Open Layers Based on Metal-oxide Chains Linked by Cyclohexanedicarboxylate Ligands," *Solid State Sciences,* (2010) 12 (1), 76-82.
3. Liu, J., Liu, M., Collins, G., Chen, C.L., Jiang, X.N., Gong, W.Q., Jacobson, A.J., He, J., Jiang, J.C., Meletis, E.I., "Epitaxial Nature and Transport Properties in (LaBa) Co2O5+delta Thin Films," *Chemistry of Materials,* (2010) 22 (3), 799-802.
4. Liu, L.M., Wang, X.Q., Jacobson, A.J., "AlF Center Dot 1,4-benzenedicarboxylate: Synthesis and Absorption Properties," *Dalton Transactions,* (2010) 39 (7), 1722-1725.
5. Liu, M., Liu, J., Collins, G., Ma, C.R., Chen, C.L., He, J., Jiang, J.C., Meletis, E.I., Jacobson, A.J., Zhang, Q.Y., "Magnetic and Transport Properties of Epitaxial (LaBa) Co2O5.5+delta Thin Films on (001) SrTiO3," *Applied Physics Letters,* (2010) 96 (13).
6. Wang, S.Y., Yoon, J., Kim, G., Huang, D.X., Wang, H.Y., Jacobson, A.J., "Electrochemical Properties of Nanocrystalline La0.5Sr0.5CoO3-x Thin Films," *Chemistry of Materials,* (2010) 22 (3), 776-782.
7. Wang, X.Q., Liu, L.M., Makarenko, T., Jacobson, A.J., "Acentric and Centric interpenetrations of an Anionic Framework Mediated by Cation Sizes: The Alkali-Metal Tin(II) Benzenedicarboxylates A(2)Sn(2)(bdc)(3)(H2O)(x) (A = Li, Na, K, Rh, Cs)," *Crystal Growth & Design,* (2010) 10 (4), 1960-1965.
8. Yun, G., Hwang, Y., Yun, H., Do, J., Jacobson, A.J., "A Vanadium Tellurate, (NH4)(2)[VO2](2)[TeO4(OH)(2)], Containing Two Edge-Shared Square-Pyramidal VO5 Groups," *Inorganic Chemistry,* (2010) 49 (1), 229-233.
9. Abeykoon, A.M.M., Donner, W., Brunelli, M., Castro-Colin, M., Jacobson, A.J., Moss, S.C., "From Average to Local Structure: A Rietveld and an Atomic Pair Distribution Function (PDF) Study of Selenium Clusters in Zeolite-NdY," *Journal of the American Chemical Society,* (2009) 131 (37), 13230-+.
10. Abeykoon, A.M.M., Li, J., Castro-Colin, M., Moss, S.C., Jacobson, A.J., "Structure of Selenium Clusters in the Framework of Zeolite Nd-Y," *Physical Review B,* (2009) 79 (13).
11. Jacobson, A.J., "Empathy and Instinct: Cognitive Neuroscience and Folk Psychology," *Inquiry-an Interdisciplinary Journal of Philosophy,* (2009) 52 (5), 467-482.
12. Jiang, J.C., He, J., Meletis, E.I., Chen, C.L., Lin, Y., Horwitz, J.S., Jacobson, A.J., "Two-dimensional Interface Structures of Epitaxial (Ba,Sr)TiO3 Film on Miscut (001) MgO," *Thin Solid Films,* (2009) 518 (1), 147-153.
13. Kim, J.H., Bryan, W.W., Chung, H.W., Park, C.Y., Jacobson, A.J., Lee, T.R., "Gold, Palladium, and Gold-Palladium Alloy Nanoshells on Silica Nanoparticle Cores," *Acs Applied Materials & Interfaces,* (2009) 1 (5), 1063-1069.
14. LeBeau, J.M., Findlay, S.D., Wang, X.Q., Jacobson, A.J., Allen, L.J., Stemmer, S., "High-angle Scattering of Fast Electrons From Crystals Containing Heavy Elements: Simulation and Experiment," *Physical Review B,* (2009) 79 (21).
15. Liu, L.M., Wang, X.Q., Jacobson, A.J., "Vanadium (IV) Benzenedicarboxylate: A Novel Adsorbent for Selective Separations," *Journal of Materials Research,* (2009) 24 (6), 1901-1905.
16. Rungrochaipon, P., Wang, X.Q., Jacobson, A.J., "Syntheses and Structures of Ta-2(WO2)(0.87)H-0.26(PO4)(4) and Ta-2(MoO2)(PO4)(4)," *Materials Research Bulletin,* (2009) 44 (3), 688-692.
17. Yoo, J., Jacobson, A.J., "Measurements of Electrical Conductivity and Oxygen Nonstoichiometry of La0.5Sr0.5Ga0.2Fe0.8O3-delta Using Gastight Electrochemical Cells," *Journal of the Electrochemical Society,* (2009) 156 (9), B1085-B1091.

T. Randall Lee

Professor Lee is a Cullen Distinguished Professor of Chemistry at UH Research in the Lee group can be divided into six general areas: (1) selectively fluorinated organic thin films, (2) complex organic interfaces with controlled local composition, structure, and function, (3) biologically active interfaces, (4) nanoparticle growth and manipulation, (5) biopolymers and conducting polymers, and (6) polymerization catalyst development. Since much of the work in the Lee group is collaborative in nature, students often work side-by-side with chemical engineers, physicists, electrical engineers, biochemists, and biomedical engineers. In this type of environment, students gain knowledge and skills beyond those typically encountered in traditional synthetic chemistry laboratories.

Publications:

1. Auragudom, P., Tangonan, A.A., Namboothiry, M.A.G.; et al., "Defect-free Poly(9,9-bis(2-ethylhexyl)fluorene-2,7-vinylene) for Polymer Light-Emitting Diode (PLED) Devices," *Journal of Polymer Research,* 17 (3), 347-353.
2. Barriet, D., Chinwangso, P., Lee, T.R., "Can Cyclopropyl-Terminated Self-Assembled Monolayers on Gold Be Used to Mimic the Surface of Polyethylene?," *Acs Applied Materials & Interfaces,* 2 (4), 1254-1265.
3. Mejac, I., Park, H.H., Bryan, W.W., Lee, T.R., Tran, C.D., "Visualizing the Lower Critical Solution Temperature Phase Transition of Individual Poly(Nipam)-Based Hydrogel Particles Using Near-Infrared Multispectral Imaging Microscopy," *Analytical Chemistry,* 82 (5), 1698-1704.
4. Srisombat, L.O., Zhang, S.S., Lee, T.R., "Thermal Stability of Mono-, Bis-, and Tris-Chelating Alkanethiol Films Assembled on Gold Nanoparticles and Evaporated "Flat" Gold," *Langmuir,* 26 (1), 41-46.
5. Alloway, D.M., Graham, A.L., Yang, X., Mudalige, A., Colorado, R., Wysocki, V.H., Pemberton, J.E., Lee, T.R., Wysocki, R.J., Armstrong, N.R., "Tuning the Effective Work Function of Gold and Silver Using omega-Functionalized Alkanethiols: Varying Surface Composition through Dilution and Choice of Terminal Groups," *Journal of Physical Chemistry C,* (2009) 113 (47), 20328-20334.
6. Bethencourt, M.I., Srisombat, L.O., Chinwangso, P., Lee, T.R., "SAMs on Gold Derived from the Direct Adsorption of Alkanethioacetates Are Inferior to Those Derived from the Direct Adsorption of Alkanethiols," Langmuir, (2009) 25 (3), 1265-1271.
7. Kim, J.H., Bryan, W.W., Chung, H.W., Park, C.Y., Jacobson, A.J., Lee, T.R., "Gold, Palladium, and Gold-Palladium Alloy Nanoshells on Silica Nanoparticle Cores," *Acs Applied Materials & Interfaces,* (2009) 1 (5), 1063-1069.
8. Kranich, A., Naumann, H., Molina-Heredia, F.P., Moore, H.J., Lee, T.R., Lecomte, S., de la Rosa, M.A., Hildebrandt, P., Murgida, D.H., "Gated Electron Transfer of Cytochrome c(6) at Biomimetic Interfaces: a Time-resolved SERR Study," *Physical Chemistry Chemical Physics,* (2009) 11 (34), 7390-7397.
9. Leem, G., Sarangi, S., Zhang, S.S., Rusakova, I., Brazdeikis, A., Litvinov, D., Lee, T.R., "Surfactant-Controlled Size and Shape Evolution of Magnetic Nanoparticles," *Crystal Growth & Design,* (2009) 9 (1), 32-34.
10. Mejac, I., Bryan, W.W., Lee, T.R., Tran, C.D., "Visualizing the Size, Shape, Morphology, and Localized Surface Plasmon Resonance of Individual Gold Nanoshells by Near-Infrared Multispectral Imaging Microscopy," *Analytical Chemistry* (2009) 81 (16), 6687-6694.
11. Srisombat, L., Khamman, O., Yimnirun, R., Ananta, S., Lee, T.R., "Phase and Chemical Characterization of Perovskite Lead Nickel Niobate Ceramics Fabricated Via a Columbite Precursor Method," *Chiang Mai Journal of Science,* (2009) 36 (1), 69-76.
12. Trabelsi, S., Zhang, S.S., Zhang, Z.C., Lee, T.R., Schwartz, D.K., "Semi-fluorinated Phosphonic Acids Form Stable Nanoscale Clusters in Langmuir-Blodgett and Self-Assembled Monolayers," *Soft Matter,* (2009) 5 (4), 750-758.
13. Trabelsi, S., Zhang, Z., Zhang, S., Lee, T.R., Schwartz, D.K., "Correlating Linactant Efficiency and Self-Assembly: Structural Basis of Line Activity in Molecular Monolayers," Langmuir, (2009) 25 (14), 8056-8061.
14. Wang, W., Zhang, S.S., Chinwangso, P., Advincula, R.C., Lee, T.R., "Electric Potential Stability and Ionic Permeability of SAMs on Gold Derived from Bidentate and Tridentate Chelating Alkanethiols," *Journal of Physical Chemistry C,* (2009) 113 (9), 3717-3725.
15. Zhang, S., Leem, G., Lee, T.R., "Monolayer-Protected Gold Nanoparticles Prepared Using Long-Chain Alkanethioacetates," *Langmuir,* (2009) 25 (24), 13855-13860.

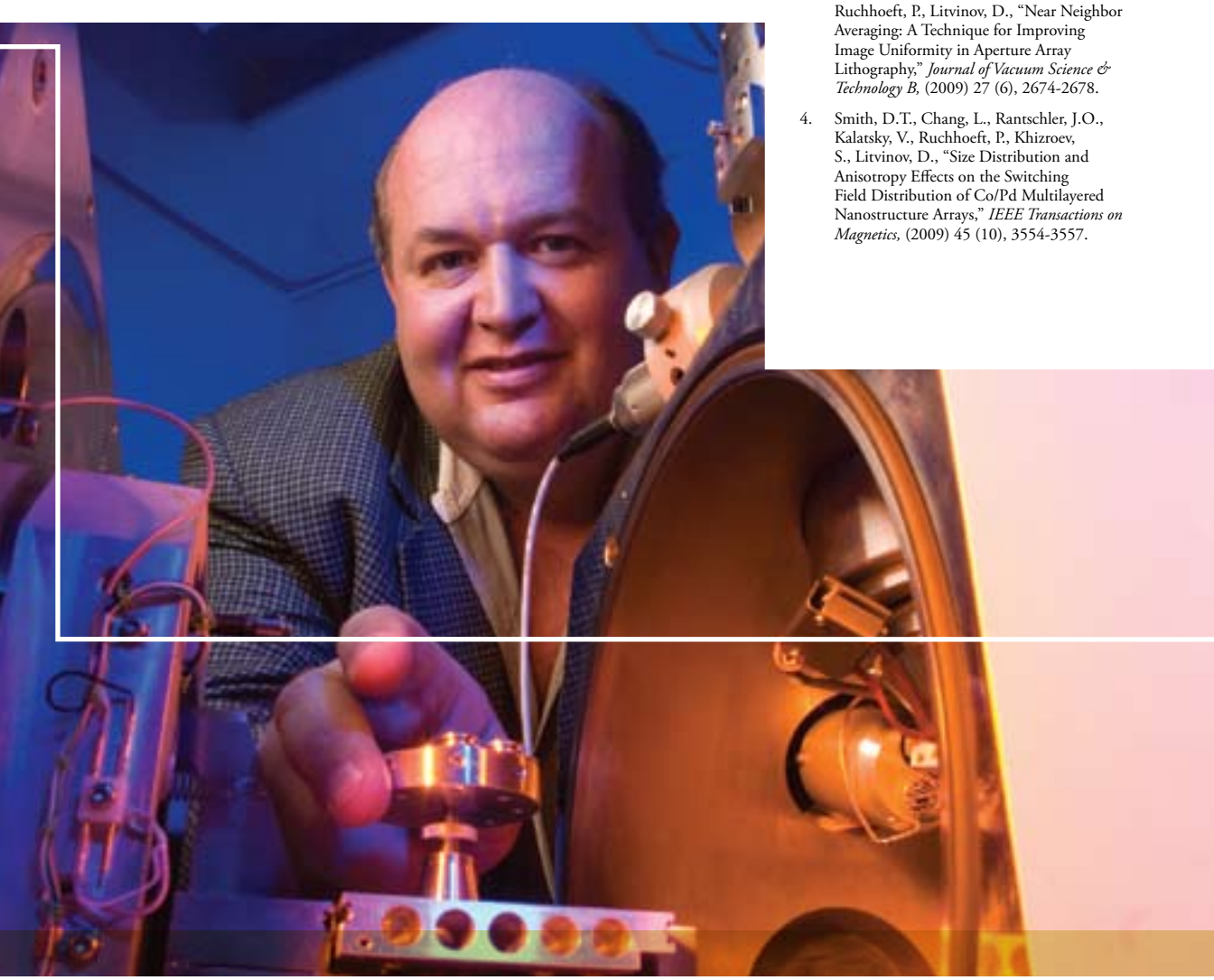
Dmitri Litvinov

Professor Litvinov leads interdisciplinary research and education programs in the rapidly developing field of nano and biomagnetics. This research field encompasses materials, devices and biological systems that have their functional magnetic building blocks with dimensions on the order of or smaller than the characteristic length, the domain wall thickness, of the constituent magnetic materials. Such single magnetic domain building blocks enable unprecedented functionalities far beyond what is achievable in conventional macroscopic systems. The nanobiomagnetics program led by Litvinov covers a range of topics from magnetic biosensors to advanced data storage devices to combustion synthesis of magnetic oxides at the nanoscale.

Among the key endeavors funded by the National Institute of Health, the Alliance for NanoHealth and National Science Foundation grants is the creation of a technology that will allow rapid evaluation of the effectiveness of potential antiviral drugs by their ability to block a virus' bond with a cell receptor, among other applications. Litvinov has co-authored a book on magnetic recording, several book chapters, over 100 research articles in peer-reviewed journals and 25 issued utility patents.

Publications

1. Amos, N., Lavrenov, A., Fernandez, R., Ikkawi, R., Litvinov, D., Khizroev, S., "High-resolution and High-coercivity FePtL1(0) Magnetic Force Microscopy Nanoprobes to Study Next-generation Magnetic Recording Media," *Journal of Applied Physics,* (2009) 105 (7).
2. Leem, G., Sarangi, S., Zhang, S.S., Rusakova, I., Brazdeikis, A., Litvinov, D., Lee, T.R., "Surfactant-Controlled Size and Shape Evolution of Magnetic Nanoparticles," *Crystal Growth & Design,* (2009) 9 (1), 32-34.
3. Nasrullah, A., Smith, D., Sherlock, T., Ruchhoeft, P., Litvinov, D., "Near Neighbor Averaging: A Technique for Improving Image Uniformity in Aperture Array Lithography," *Journal of Vacuum Science & Technology B,* (2009) 27 (6), 2674-2678.
4. Smith, D.T., Chang, L., Rantschler, J.O., Kalatsky, V., Ruchhoeft, P., Khizroev, S., Litvinov, D., "Size Distribution and Anisotropy Effects on the Switching Field Distribution of Co/Pd Multilayered Nanostructure Arrays," *IEEE Transactions on Magnetics,* (2009) 45 (10), 3554-3557.



Vincent Tam

Professor Tam's research is in the general area of pharmacokinetics, pharmacodynamics of antimicrobials, mathematical modeling and simulation of biological processes, and understanding the mechanisms of bacterial resistance. These complement the research of several ChBE faculty members, opening up opportunities for improving existing collaboratives and forging new ones.

Publications:

1. Hirsch, E.B., Tam, V.H., "Detection and Treatment Options for Klebsiella Pneumoniae Carbapenemases (KPCs): An Emerging Cause of Multidrug-resistant Infection," *J. Antimicrob Chemother,* (2010) 65(6), 1119-1125
2. Tam, V.H., Chang, K.T., Abdelraouf, K., Brioso, C.G., Ameka, M., McCaskey, L.A., Weston, J.S., Caeiro, J.P., Garey, K.W., "Prevalence, Mechanism and Susceptibility of Multidrug Resistant Bloodstream Isolates of Pseudomonas Aeruginosa," *Antimicrob Agents Chemother,* (2010) 54(3), 1160-1164
3. Hsu, L.Y., Tan, T.Y., Tam, V.H., Kwa, A.L., Fisher, D.A., Koh, T.H., "Surveillance and Correlation of Antibiotic Prescription and Gram-negative Resistance in Singapore Hospitals," *Antimicrob Agents Chemother,* (2010) 54(3), 1173-1178
4. He, J., Figueroa, D.A., Lim, T.P., Chow, D.S., Tam, V.H., "Stability of Polymyxin B Sulfate in 0.9% Saline Infusion Bags at Different Storage Temperatures," *Am. J. Health Syst. Pharm.,* (2010) (accepted).
5. He, J., Ledesma, K.R., Lam, W.Y., Figueroa, D.A., Lim, T.P., Chow, D.S., Tam, V.H., "Variability of Polymyxin B Major Components in Commercial Formulations," *Int. J. Antimicrob. Agents,* (2010) 35(3), 308-310
6. Yuan, Z., Ledesma, K.R., Singh, R., Hou, J.G., Prince, R.A., Tam, V.H., "Quantitative Assessment of Combination Antimicrobial Therapy Against Multi-drug Resistant Bacteria in a Murine Pneumonia Model," *J. Infect. Dis.,* (2010) 201(6), 889-897
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9. Kuper, K.M., Hirsch, E.B., Tam, V.H., "Significant Publications on Infectious Diseases Pharmacotherapy in 2008," *Am. J. Health Syst. Pharm.,* (2009) 66(19), 1726-1734
10. Singh, R., Ledesma, K.R., Chang, K.T., Hou, J.G., Prince, R.A., Tam, V.H., "Pharmacodynamics of Moxifloxacin Against a High Inoculum of Escherichia Coli in an In Vitro Infection Model," *J. Antimicrob. Chemother,* (2009) 64(3), 556-562
11. Tam, V.H., Ledesma, K.R., Schilling, A.N., Lim, T.P., Yuan, Z., Ghose, R., Lewis, R.E., "In-vivo Dynamics of Carbapenem-resistant Pseudomonas Aeruginosa Selection Following Sub-optimal Dosing," *Diagn. Microbiol. Infect. Dis.,* (2009) 64(4), 427-433
12. Tam, V.H., Ledesma, K.R., Chang, K.T., Wang, T.Y., Quinn, J.P., "Killing of Escherichia Coli by Beta-lactams at Different Inocula," *Diagn. Microbiol. Infect. Dis.,* (2009) 64(2), 166-171
13. Tam, V.H., Hou, J.G., Kwa, A.L., Prince, R.A., "Comment On: Development and Validation of a Reverse-phase High-performance Liquid Chromatography Assay for Polymyxin B in Human Plasma," *J. Antimicrob. Chemother.,* (2009) 63(3), 627-628
14. Tam, V.H., Chang, K.T., Schilling, A.N., LaRocco, M.T., Gentry, L.O., Garey, K.W., "Impact of AmpC Over-expression on Outcomes of Patients with Pseudomonas Aeruginosa Bacteremia," *Diagn. Microbiol. Infect. Dis.,* (2009) 63(3), 279-285
15. Garey, K.W., Vo, Q.P., Lewis, R.E., Saengcharoen, W., LaRocco, M.T., Tam, V.H., "Increased Bacterial Adherence and Biomass in Pseudomonas Aeruginosa Bacteria Exposed to Clarithromycin," *Diagn. Microbiol. Infect. Dis.,* (2009) 63(1), 81-86

Research Faculty

Valery Khabashesku

Professor Khabashesku's research interests involve chemistry and spectroscopy of transient molecules containing double and triple p-bonds at group 14 elements (C, Si, Ge, Sn), carbenes and their silicon and germanium analogues, small strained metallacycles, reaction mechanisms, matrix isolation spectroscopy, mass spectrometry, molecular structure and bonding, quantum chemical calculations, vacuum pyrolysis and photochemistry, low-temperature chemistry, routes from reactive intermediates to organic/inorganic polymers and ceramics, fluorination and derivatization of fullerenes, polyfullerenes, carbon nanotubes and nanodiamonds for bio-medical and materials engineering applications, synthesis and characterization of carbo-nitride nano- and microscale materials, high pressure/high temperature synthesis and characterization of potentially superhard all-carbon and C3N4 phases, chemistry of materials and nanoscience, design and manufacturing of polymer nanocomposites, hydrogen storage materials, nanolubricants, and surface coatings chemistry and technology.

Patents

1. Sidewall and end functionalization of carbon nanotubes with hydroxyl-terminated moieties. Khabashesku, V.N., Zhang, L., Margrave, J,L., U.S. Patent No. 7,632,481 Issued on Dec. 15, 2009.

Publications

1. Filonenko, V.P., Davydov, V.A., Zibrov, I.P., Agafonov, V.N., Khabashesku, V.N., "High Pressure Synthesis of New Heterodiamond Phase," *Diamond Relat. Mater.,* (2010) 19, 541–544.
2. Davydov, V.A., Shiryaev, A.A., Rakhmanina, A.V., Filonenko, V.P., Vasil'ev, A.L., Autret, C., Agafonov, V.N., Khabashesku, V.N., "Polyhedral Nanosize Carbon Particles at High Pressures and Temperatures," *JETP Letters,* (2009) vol. 90, N. 12, pp. 763–767.
3. Pulikkathara, M.X., Kuznetsov, O.V., Peralta, I.R.G., Wei, X., Khabashesku,* V.N., "Medium Density Polyethylene Composites with Functionalized Carbon Nanotubes," *Nanotechnology,* (2009) 20, 195602.
4. Zinin, P. V., Ming, L.C., Sharma, S.K., Khabashesku, V.N., X.R. Liu, S. M. Hong,S. Endo, T. Acosta. Raman Spectroscopy of graphitic C3N4 phase. Chem. Phys. Lett., 2009, 472, 69–73.
5. Li, J., Lu, Y., Pulikkathara, M.X., Kuznetsov, O.V., Khabashesku, V.N., Wilkins, R.T., Boul, P.J., Sosa, E.D., Turner, K., O'Rourke, M.J., Moloney, P., Arepalli, S., Yowell, L., "Single Wall Carbon Nanotube Response to Proton Radiation," *J. Phys.Chem. C,* (2009) 113, 14467–14473
6. Rostro, B.C., Selinger, S., Rosenberg, N., Khabashesku*, V.N., Barrera, E.V., "Self-assembled Fibrillar Carbon Nanotube Heat Transfer Gels with Enhanced Thermal Conductivities," *Graphene and Graphite Materials,* Ed. by H.E.Chen, ISBN: 978-1-60692-666-6. Series: Materials Science and Technologies. Nova Science Publishers, Inc. NY, (2009).
7. Khabashesku*, V.N., Kuznetsov, O.V., Pulikkathara, M.X., "Carbon Nanotubes: Fluorinated Derivatives," Book Chapter in Nanomaterials: Inorganic and Bioinorganic Perspectives. Ed. C.M. Lukehart and R.A. Scott, John Wiley & Sons, Ltd, ISBN: 978-0-470-51644-7, 856 p., (2009).

Grants

$	50,000	Clarkson Aerospace Corporation, "Nanoclay Reinforced Polyurea for Blast-Resistant Applications," jointly with R. Krishnamoorti, 1/10-12/10
$	74,999	Materials & Electrochemical Research Corporation (MER), DOD-ONR, "STTR Phase II: Functionalized DWNTs for High Performance Composites," Sole PI, 7/08-1/10
$	245,000	DOD-ONR/MER Corporation, STTR I,II and Option "Ultrahigh Loading of DWNTs for Advanced Composites," Sole PI, 8/08-2/13
$	6,850	US Civilian Research and Development Foundation (CRDF). "Synthesis of New Materials From Pristine and Surface-Functionalized Nanoscale Forms of Carbon Under Combined Action of High Pressure, Temperature, Laser and X-ray Radiation," Sole PI, 9/08-8/10

Katerina Kourentzi

Professor Kourentzi's research lies in the interface of engineering, nanotechnology and biology and focuses on the development of ultra sensitive molecular diagnostic assays. She is interested in understanding the fundamentals of antibody-antigen and aptamer-protein recognition and in applying the acquired knowledge in the development of ultra sensitive nanoparticle-based detection assays.

Publications:

1. Mohan, S., Kourentzi, K., Shick, K., Uehara, C., Lipschultz,C., Acchione, M., DeSantis, M.E., Smith-Gill, S.E., Willson, R.C., "Association Energetics of Cross-reactive and Specific Antibodies," *Biochemistry,* (2009) 48, 1390-1398
2. Zhang, X., Potty, A.S.R., Jackson G.W., Stepanov, V., Tang, A., Liu, Y., Kourentzi, K., Strych, U., Fox, G.E., Willson, R.C., "Engineered 5S Ribosomal RNAs Displaying Aptamers Recognizing Vascular Endothelial Growth Factor and Malachite Green," *Journal of Molecular Recognition,* (2009) 22, 154-161
3. Potty, S.R., Kourentzi, K., Fang, H., Jackson, G.W., Zhang X., Legge, B.G., Willson, R.C., "Biophysical Characterization of DNA Aptamer Interactions with Vascular Endothelial Growth Factor," *Biopolymers,* (2009) 91, 145-156

Grants:

$	85,000	The Norman Hackerman Advanced Research Program, "Ultra-sensitive and Specific Detection of Biomarkers Using Magnetic Immuno-particle Amplification," jointly with R.C. Willson and U. Strych

Karen Martirosyan

Professor Martirosyan's research is aimed towards building an inter-disciplinary field of chemical engineering, solid state physics, and materials science focusing on the use of high energetic reactions to design innovative processes and novel advance nano-tailored materials for energy, environmental and biomedical applications. The research area covers a broad spectrum of advanced materials and their design, synthesis, characterization, and physical phenomena. The research goal is to develop large scale and efficient synthesis methods of advanced nano/submicron composites such as ferroelectrics, hard/soft magnetic materials, multiferroics, superconductors, optoelectronics, solid-oxide fuel cell components, battery electrodes, catalysts, membranes, digital pigments, MRI contrast agents and designing novel materials with desired structure, properties, and behavior for energy, environmental and biomedical applications. The efforts are directed towards the understanding of kinetics and mechanism of structure formation and prediction of their functional physical-chemical properties. This understanding is used to enhance the efficiency of technological process and material properties.

Publications:

1. Frank, S.J., Tailor, R., Martirosyan, K.S., Stafford, R.J., Swanson, D., Sing, D., Choi, J., Elliot, A., Mourtada, F., Kudchadker, R., Ibbott, G., "Dosimetric Characterization of I-125 Seed with C4-ECAMs for MRI-based Prostate Brachytherapy," *Int. J. of Radiation Oncology, Biology and Physics,* (2010) (in print).
2. Chen, K., Martirosyan, K.S., Luss, D., "Temperature Excursions During Soot Combustion in Diesel Particulate Filter (DPF)," *Ind. Eng. Chem. Res.,* (2010) (in print).
3. Chen, K., Martirosyan, K.S., Luss, D., "Hot Zones Formation During Regeneration of Diesel Particulate Filters," *AIChE J,* (2010) (in print).
4. Martirosyan, K.S., Wang, L., Luss, D., "Development of Nanoenergetic Materials Based on Al/I2O5 System," *Nano Tech,* (2010), 137-140.
5. Martirosyan, K.S., Chen, K., Luss, D., "Behavior Features of Soot Combustion in Diesel Particulate Filter," *Chemical Engineering Science,* (2010) 65, 1, 42-46.
6. Martirosyan, K.S., Galstyan, E., Litvinov, D., "Fabrication and Magnetic Properties of Submicron-textured Magnetostrictive Alloys," *Int. J of SHS.,* (2009) 18 (3), 207–212.
7. Martirosyan, K.S., Wang, L., Vicent, A., Luss, D., "Nanoenergetic Gas-Generator: Design and Performance, Propellants, Explosives," *Pyrotechnics,* (2009) 34, 532-538.
8. Martirosyan, K.S., Wang, L., Luss, D., "Novel Nanoenergetic System Based on Iodine Pentoxide," *Chem. Phys. Lett,* (2009) 483, 107-110.
9. Martirosyan, K.S., Wang, L., Vicent, A. Luss, D., "Synthesis and Performance of Bismuth Trioxide Nanoparticles for High Energy Gas Generator Use," *Nanotechnology,* (2009) 20, 405609, highlighted in http://nanotechweb.org.
10. Chen, K., Martirosyan, K.S., Luss, D., "Wrong-way Behavior of Soot Combustion in a Planar Diesel Particulate Filter," *Ind. Eng. Chem. Res.,* (2009) 48 (18), 8451–8456.
11. Martirosyan, K.S., Luss, D., "Fabrication of Metal Oxides Nanoparticles by Highly Exothermic Reactions," *Chem. Eng. and Technology,* (2009) 32, 9, 1376-1383, highlighted in http://www.verticalnews.com.
12. Frank, S.J., Tailor, R., Martirosyan, K., Stafford, R.J., Swanson, D., Sing, D., Choi, J., Elliot, A., Mourtada, F., Kudchadker, R., Ibbott, G., "C4 MRI ECAMS Have No Effect on 125I Seed Anisotropy and are Visible After Radiation Exposure," *Brachytherapy,* (2009) 8, 2, 172.
13. Chen, K., Martirosyan, K.S., Luss, D., "Soot Combustion Dynamics in a Planar Diesel Particulate Filter," *Ind. Eng. Chem. Res.,* (2009) 48 (7), 3323–3330.
14. Chen, K., Martirosyan, K.S., Luss, D., "IR Imaging of Soot Regeneration on a Planar Diesel Particulate Filter," *NSTI-Clean Tech,* (2009), 135-138.
15. Martirosyan, K.S., Wang, L., Vicent, A. Luss, D., "Fabrication of Bismuth Trioxide Nanoparticles for Gas-Generators Applications," *NSTI-Nano Tech,* (2009) 2, 82-85.
16. Martirosyan, K.S., Stafford, R.J., Elliott, A.M., Frank, S.J., "PMMA/SWCNTs Composites for Prostate Brachytherapy MRI Contrast Agent Markers," *NSTI-Nano Tech,* (2009) 2, 44-47.

Grants:

$ 112,500	Prostate Cancer Foundation (Subcontract to MD Anderson Cancer Center), "A Novel Nanoparticle Approach to MRI Prostate Brachytherapy," 9/08-8/11
$ 291,000	Rice University, (Subcontract to Rice University in the CONTACT Proposal to the US Air Force Research Laboratory Consortium for Nanomaterials for Aerospace Commerce and Technology), "Nanoenergetic Gas Generators," jointly with A. Jacobson, D. Luss, 8/08-10/10
$ 133,772	National Science Foundation, "Carbon Combustion Synthesis in Patterned Precursor Media," jointly with D. Litvinov, 9/09-8/12
$ 25,000	Institute of Space Systems Operations, "Nanostructured Oxygen Generators for Aerospace Life Supporting Applications," 04/10-08/10
$ 25,000	UH, GEAR, "Thermosensitive Nanostructured Media for MR Imaging," 9/10-8/11

Rachel Muncrief

Professor Muncrief's research involves evaluating various strategies for the control of NOx, and particulate matter in diesel exhaust. She is currently working on four EPA-funded projects in which vehicles from various local fleets are retrofitted with aftertreatment devices, and the effectiveness of these devices at reducing harmful emissions is evaluated. Additional projects Rachel is working on focus on the production and use of renewable fuels, as well as bench-scale catalyst testing.

Publications:

1. An, H., Muncrief, R., Harold, M., Ismail, H., "Benchtop Engine System for Screening of Diesel Fuel and Additives for NOx Reduction," SAE, Paper Number 2010-01-1293 (2010).

Grants

- $ 929,147 US Environmental Protection Agency, "Retrofit and In-Use Testing of On-Highway Vehicles with Nett Technologies Blue Max Selective Catalytic Reduction System," jointly with M.P. Harold and C.W. Rooks, 5/10-4/12
- $ 60,588 City of Houston, Texas, "Testing of Synthetic Gas to Liquids (GTL) Diesel Fuel and City of Houston Solid Waste Vehicles," jointly with M.P. Harold and C.W. Rooks, 11/09-12/09
- $ 2,039,000 Texas Commission on Environmental Quality, "UH SCR Project: Texas Diesel Emission Testing & Research Laboratory -- Testing, Research and Development Phase," jointly with M.P. Harold and C.W. Rooks, 5/09-5/11
- $ 1,421,621 US Environmental Protection Agency, "ARRA - ET University of Houston TECT," jointly with M.P. Harold, C.W. Rooks and V. Balakotaiah, 8/09-10/10
- $ 1,186,767 US Environmental Protection Agency, "ARRA - ET University of Houston Tinnerman Shadowood," jointly with M.P. Harold and C.W. Rooks, 8/09-10/10
- $ 500,000 U.S. Environmental Protection Agency, "Retrofit and In-Use Testing of Ten Nonroad Vehicles with Nett Technologies Blue Max Selective Catalytic Reduction System," jointly with M.P. Harold and C.W. Rooks, 3/09-3/11
- $ 85,000 National Science Foundation, "ARRA Equipment Proposal: Multiple Capillary Probe Inlet System for Spatio-Temporal Studies in Multi-Functional Catalytic Reactors," jointly with M.P. Harold, 9/09-8/10
- $ 93,938 Texas Commission on Environmental Quality, "Dr. Dan Luss Project: Texas Diesel Emission Testing and Research Laboratory - Testing, Research and Development Phase," jointly with M.P. Harold, C.W. Rooks and D. Luss, 6/09-5/11

Charles Rooks

One of Prof primary missions is the continuous improvement of the Undergraduate Chemical & Biomolecular Engineering Laboratory. This includes upgrading the instrumentation in the lab and modernizing the experiments to more closely reflect what students will find in industry when they graduate. Rooks is also director of the Texas Diesel Testing and Research Facility, where they evaluate various strategies for the control of NOx, SOx, and particulates in diesel exhausts. They work with the State of Texas, EPA, DOE and others to devise a method of accurately evaluating various emission reduction technologies for the diesel fleets.

Grants:

- $ 929,147 US Environmental Protection Agency, "Retrofit and In-Use Testing of On-Highway Vehicles with Nett Technologies Blue Max Selective Catalytic Reduction System," jointly with M.P. Harold and R. Muncrief, 5/10-4/12
- $ 60,588 City of Houston, Texas, "Testing of Synthetic Gas to Liquids (GTL) Diesel Fuel and City of Houston Solid Waste Vehicles," jointly with M.P. Harold and R. Muncrief, 11/09-12/09
- $ 2,039,000 Texas Commission on Environmental Quality, "UH SCR Project: Texas Diesel Emission Testing & Research Laboratory -- Testing, Research and Development Phase," jointly with M.P. Harold, R. Muncrief and V. Balakotaiah, 5/09-5/11
- $ 1,421,621 US Environmental Protection Agency, "ARRA - ET University of Houston TECT," jointly with M.P. Harold and R. Muncrief, 8/09-10/10
- $ 1,186,767 US Environmental Protection Agency, "ARRA - ET University of Houston Tinnerman Shadowood," jointly with M.P. Harold and R. Muncrief, 8/09-10/10
- $ 500,000 US Environmental Protection Agency, "Retrofit and In-Use Testing of Ten Nonroad Vehicles with Nett Technologies Blue Max Selective Catalytic Reduction System," jointly with M.P. Harold and R. Muncrief, 3/09-3/11
- $ 93,938 Texas Commission on Environmental Quality, "Dr. Dan Luss Project: Texas Diesel Emission Testing and Research Laboratory - Testing, Research and Development Phase," jointly with M.P. Harold, R. Muncrief and D. Luss, 6/09-5/11
- $10,192,172 Texas Commission on Environmental Quality, "Establishment of the University of Houston Texas Diesel Emission Testing and Research Laboratory," jointly with C.W. Rooks and V. Balakotaiah, 9/07-8/09

The University of Houston

The UH campus incorporates 548 acres of parks, fountains, plazas, sculptures and recreational fields surrounding modern classroom, laboratory and study facilities, affording students a comfortable and well-equipped setting for academic pursuits and proximity to the downtown area of the nation's fourth-largest city.

UH researchers collaborate extensively with workers in the Texas Medical Center, NASA's Johnson Space Center, and the Houston-area Keck Center for Computational Biology (cohesion.rice.edu/centersandinst/gcc/keck.cfm).

UH's more famous alumni include founder of Compaq Computers Rod Canion; Astronauts Bonnie Dunbar, Rex Walheim, Danny Olivas and Nancy Curry.

The UH discovery of high-temperature superconductors led to the establishment of the Texas Center for Superconductivity at UH, the largest university superconductivity research effort in the United States.

UH ranked tenth in the nation in citation frequency in the physical sciences (physics, chemistry, earth sciences, engineering, mathematics and applied sciences) according to Nature.

Houston

Houston is the fourth-largest city in the United States, with nearly two million city residents and 4.5 million in the metropolitan region. Houston is home to the largest medical center in the world, employing more than 62,000 with a local economic impact of $14 billion. A $600-million biotechnology commercialization park is now under development.

Houston has the lowest crime rate and second-lowest cost of living among major American cities. In addition, Houston has the most affordable housing of the 10 most populated metropolitan areas, 39 percent below the average of U.S. cities with a population of more than 1.5 million.

Among the 10 largest U.S. cities, Houston ranks second in the rate of job growth. Houston also ranks eighth out of 354 U.S. metro areas in overall quality of life.* Home to 18 Fortune 500 companies and more than 5,000 energy-related firms, Houston is considered by many as the Energy Capital of the world. More than 90 languages are spoken throughout the Houston area.

Houstonians dine out (in more than 11,000 restaurants) more than residents of any other city. The Houston Theater District is second only to New York City with its concentration of seats in one geographic area. A youthful city, 37 percent of Houstonians are 24 years old or younger, and 71 percent are under 44.

For three consecutive years, Houston has ranked first in the nation in new business growth. In the most recent survey, more than 31,000 new local businesses were started in Houston. Los Angeles was a distant second with 16,780.

*Source: Places Rated Almanac

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