UF College of Engineering
UNIVERSITY of FLORIDA

DEPARTMENT OF CHEMICAL ENGINEERING

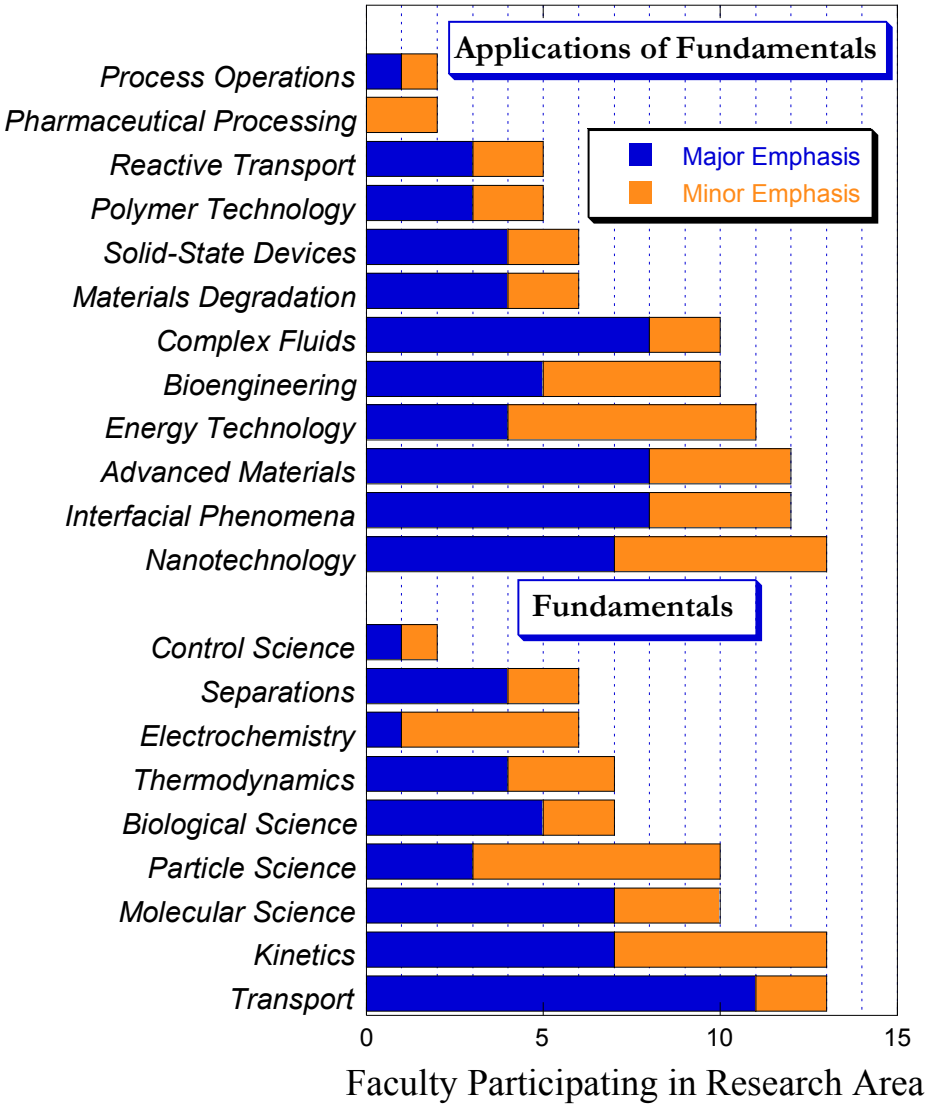
WE ARE POWERING THE NEW ENGINEER

LEADERSHIP · INNOVATION · INTERDISCIPLINARY RESEARCH

About the Department

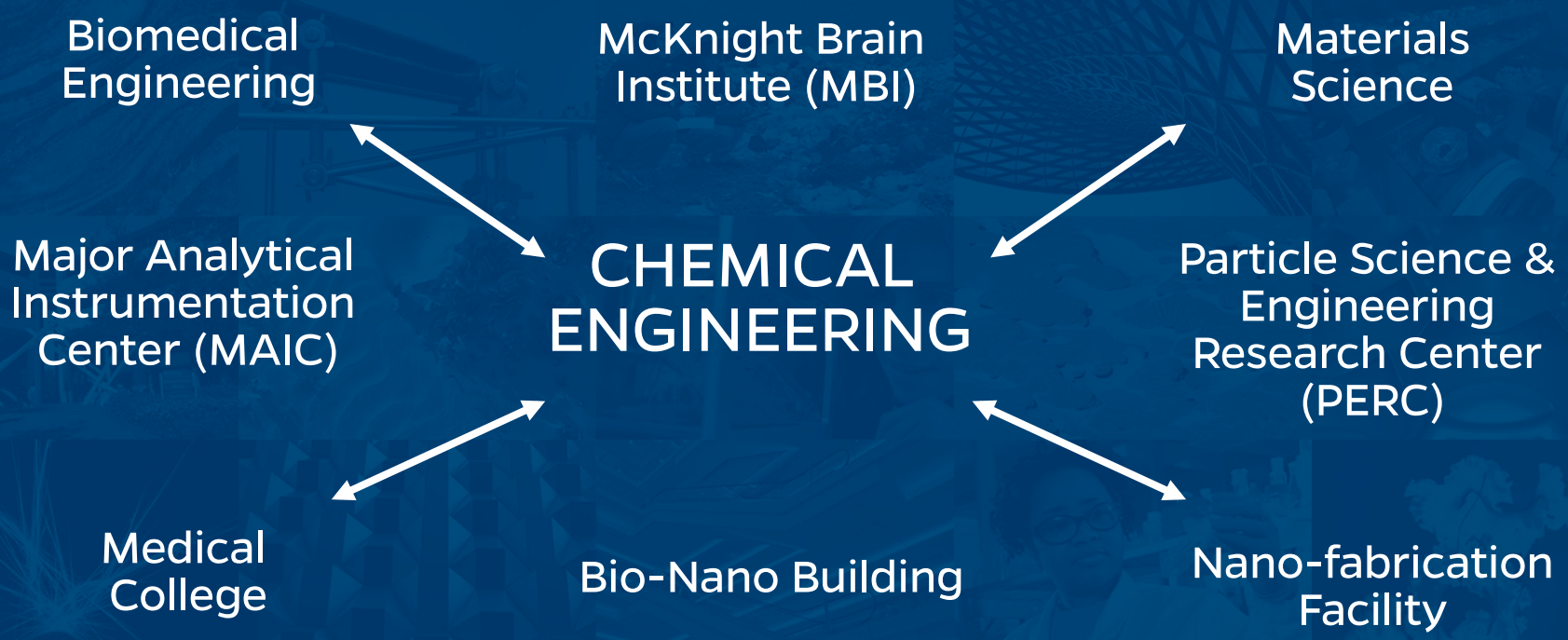
- Strong research in diverse areas including Biomedical, Nanotech, Energy
- Excellent research infrastructure & access to state of the art centers
- Highly interdisciplinary research with collaborations at UF and worldwide
- Excellent mix of fundamental and applied research
- Excellent faculty with diverse research interests
- Diverse and a socially and intellectually active student body
- Excellent placement after graduation both in academics and industry
- Excellent publication record for both students and faculty
- New building addition providing improved infrastructure

Main Thrust Areas



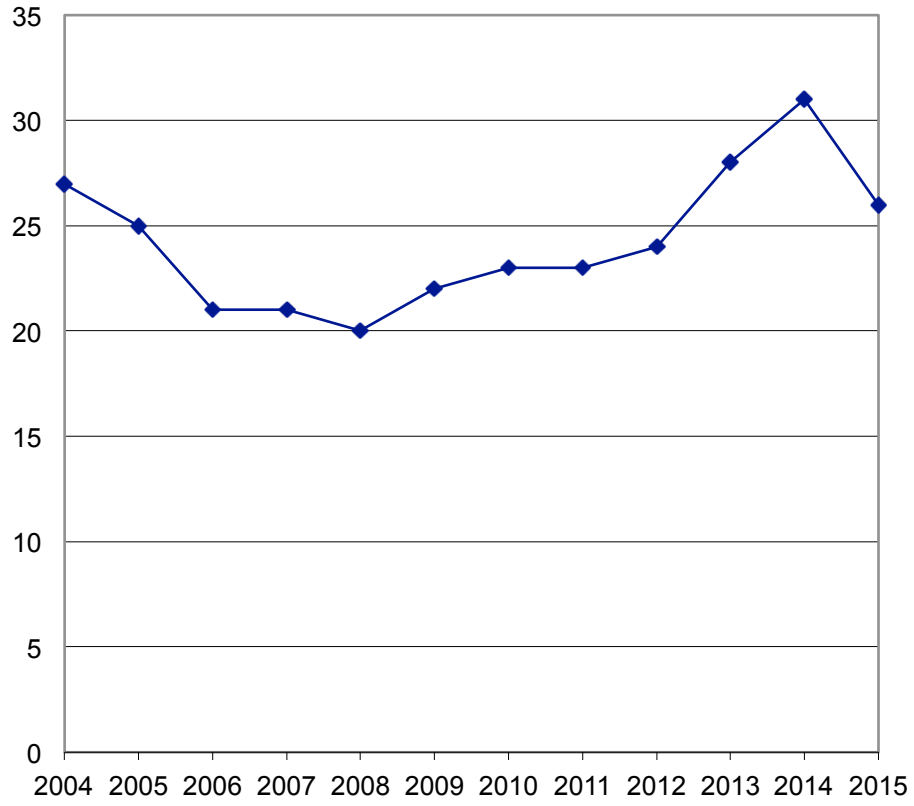
Facilities & Collaborations

In addition to resources within the department, we have access to cutting-edge fabrication facilities and analytical techniques at a number of centers.



US NEWS & WORLD REPORT 2015 RANKING

Currently ranked #26



FACULTY AWARDS & HONORS

- 8 CAREER Awards (of 10 eligible)
- 3 Distinguished Professors
- 2 AICHE Fellows
- 2 ASEE Fellows
- 3 Fulbright Scholars
- 2 ECS Fellows
- 1 SPIE Fellow
- 1 AIBME Fellow
- 1 IEEE Fellow
- 1 AVS Fellow
- 1 Presidential Young Investigator
- 2 Humboldt Awards

TOP RECRUITERS

Air Products and Chemicals, Inc.
Amoco Production Co.
Arizona Chemical Co.
Buckeye Technology Company
Cargill, Inc.
Celanese Americas Foundation
Chevron Texaco Corp.
Dow
DuPont
Eastman Kodak Co.
Exxon Mobile
Florida Power & Light Co.
Intel Corp.
International Paper Corporation
Kimberly-Clarke
Kraft Foods, Inc.
Lockheed Martin Corp.
Merck & Co., Inc.
Milliken Chemicals
Motorola, Inc.
Procter & Gamble
Shell Oil
Texas Instruments, Inc.
U.S. Navy
Westinghouse Savannah River Co.

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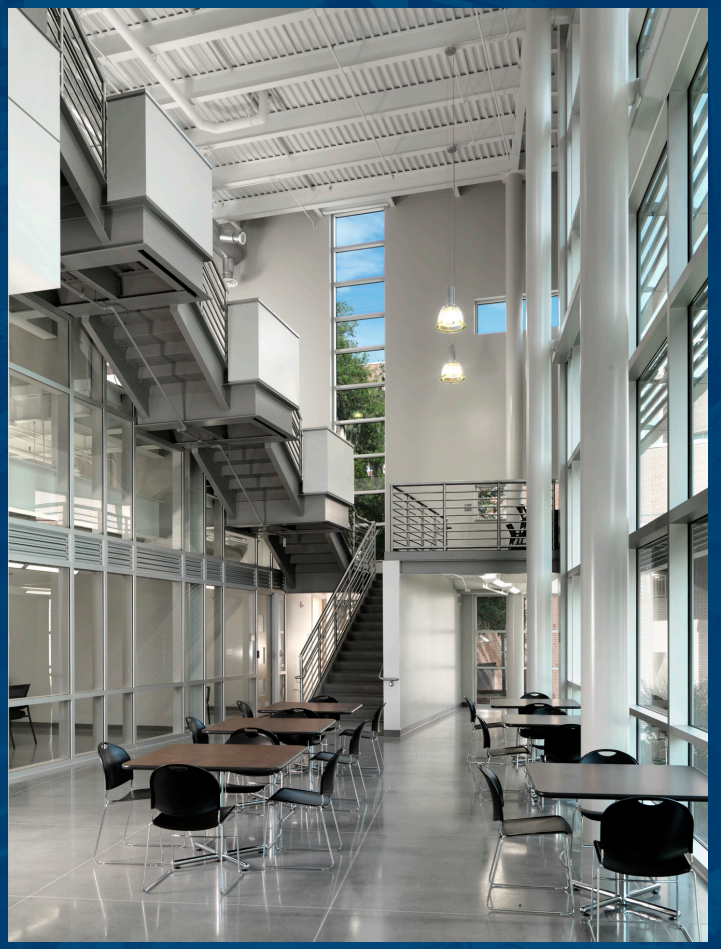
Department of Chemical Engineering

BUILDING ADDITION

The new, 9,800+ square-foot LEED certified, Chemical Engineering Student Center opened on October 4, 2013. Funded entirely by private donations, the $3.9 million project was constructed in two phases.

Building Features

- Multiple study and collaboration spaces designed by students, featuring study pods and glass-enclosed breakout rooms with white boards, power outlets and enhanced technology resources.
- A vast, multi-story atrium.
- A new academic advising suite, designed to more efficiently accommodate student needs.



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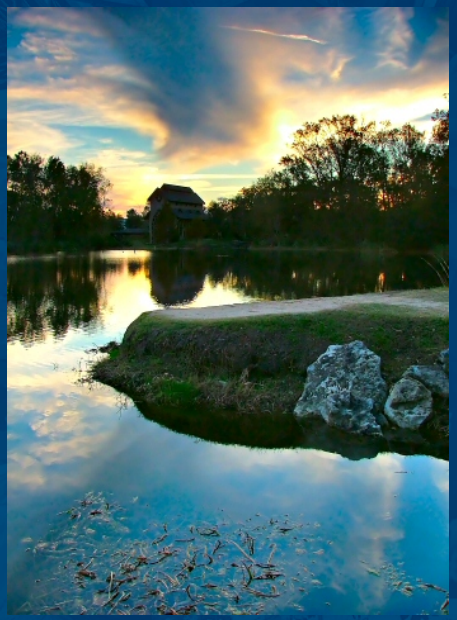
Enjoy culture, wildlife & nightlife in Gainesville!

The area is surrounded by natural wonders, including rivers, lakes and the famous Crystal Springs. Gainesville was named Florida Tree City of the Year in 1997, one of the many reasons why outdoor enthusiasts regularly head for any of the 40 nature parks within 50 miles to picnic, boat, swim, dive, hike, camp, bike, hunt or fish.

- UF has one of the most beautiful campuses in the nation with wonderful landscapes and a great presence of wildlife. A variety of birds, insects, plants and flowers can be observed year round.
- Enjoy daily spectacular sunsets, sunny skies and the beauty of a campus integrated with nature.
- The campus is part of the Great Florida Birding trail.
- The daily outing of the Mexican bats across Lake Alice is a crowd pleaser.



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UF & GAINESVILLE OFFER NUMEROUS AVENUES FOR CULTURAL ACTIVITIES

- The Phillips Center for Performing Arts brings great shows and performances to town at affordable prices year round.
- The Hippodrome Theater downtown, although small, is one of the most important state theaters, since it was built in 1911.
- UF has a very active Performing Arts Department that regularly produces exciting plays, shows and concerts.
- Two important museums reside in the campus, exhibiting contemporary and classic arts and nature-themed exhibits.

DOWNTOWN GAINESVILLE IS THE CENTER FOR NIGHTLIFE IN THE CITY.

- Dozens of nightclubs, bars, and restaurants feature live entertainment nightly and cater to residents of all ages and lifestyles.
- Fans of alternative rock, country, disco, reggae, and jazz can all find a great place to dance and socialize.
- You can catch or be a part of local bands such as Kid Robot, which includes 2 ChemE grad students.

ENJOY INTRAMURAL SPORTS WHILE ON CAMPUS

- Basketball
- Bowling
- Dodgeball
- Flag Football
- Golf
- Indoor & outdoor soccer
- Racquetball
- Sand Volleyball
- Softball
- Swimming
- Tennis & table tennis
- Track
- Ultimate Frisbee
- Water Polo

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MEET OUR FACULTY

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JASON E. BUTLER, PROFESSOR

Ph.D., 1998, University of Texas at Austin

butler@che.ufl.edu

Dynamics of Complex Fluids, Suspension and Multiphase Fluid Mechanics, Polymer Dynamics, Microfluidic Flows of Complex Materials

My research group is generating insights and solutions to problems regarding the transport of complex fluids using experimental, computational, and theoretical methods. Complex fluids, which encompass suspensions of particulates, emulsions, polymer solutions, and more, serve important roles in a wide range of industries as well as emerging technologies. Efficient control and processing of these fluids requires predictive capabilities that, in most cases, are lacking, as they often demonstrate nonlinear dynamics that create unexpected and intriguing observations.

ANUJ CHAUHAN, PROFESSOR & ASSOCIATE CHAIR

Ph.D., 1998, City University of New York

chauhan@che.ufl.edu

Ophthalmic Biomaterials, Interfacial and Colloidal Phenomena, Nanomanufacturing

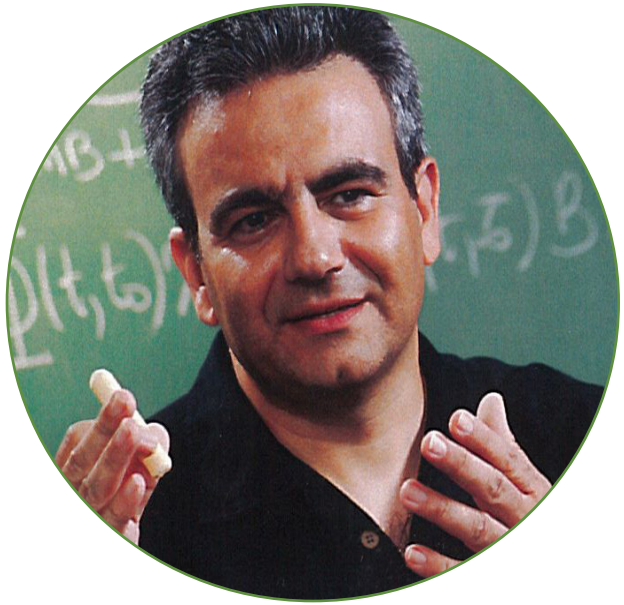
Our group is interesting in exploring problems at the interface of materials design, interfacial phenomena and transport. Currently a majority of our efforts are focused on ophthalmic biomaterials and pharmaceutical formulations. In each case, our goal is to integrate the fundamentals into the application driven research to solve problems of immense societal interest.

OSCAR CRISALLE, PROFESSOR

Ph.D., 1990, University of California, Santa Barbara

crisalle@che.ufl.edu

Process Modeling, Robust Control Design for Uncertain Systems, Predictive Control, Virtual Sensors, Green and Renewable Energy Optimization, Fuel Cells



Our research focuses on the analysis and design of advanced control systems, with applications to chemical-processing and energy-generation industries. Our guiding philosophy is to establish new theoretical foundations, and validate advances through computer simulation studies and experimental implementations. The applications include energy production systems and fuel cells, the manufacture of integrated microelectronic and photovoltaic devices, and the development of on-line measurement instrumentation.

JENNIFER CURTIS, DISTINGUISHED PROFESSOR & ASSOCIATE DEAN, RESEARCH & FACILITIES

Ph.D., 1989, Princeton University

jcurtis@che.ufl.edu

Fluidization, Particle Technology, CFD and DEM Modeling for Particulate Flows

Particulate flows are prevalent across a diverse range of industrial and geophysical processes. Examples include pharmaceutical processes, conveying lines for transporting minerals, ores, food and agricultural products, fluidized bed reactors, debris flows and sediment transport.

RICHARD DICKINSON, PROFESSOR & DEPARTMENT CHAIR

Ph.D., 1992, University of Minnesota

dickinson@che.ufl.edu

Biomolecular Motors and Cell Motility, Biomedical Device-Centered Infections, Adhesion-Mediated Cell Migration

Our research is in the area of molecular/cellular bioengineering. We apply engineering principles to student the behavior of living cells or other small-scale biological systems. Using a combination of engineering modeling/analysis, quantitative experimentation, together with the tools of molecular cell biology, we seek to better understand the relationship between cell function and the physical and molecular properties of cells and their environment. Our projects are typically in collaboration with experts in microscopy cell biology.

HELENA HAGELIN-WEAVER, ASSISTANT PROFESSOR

Ph.D., 1999, Royal Institute of Technology, Stockholm

hweaver@che.ufl.edu

Heterogeneous Catalysis, Nanoparticle Oxide Shapes, Atomic Layer Deposition, Surface Characterization, Renewable Energy Applications

We work on heterogeneous catalyst development in my laboratory and our ultimate goal is to obtain a fundamental understanding of these catalysts at the atomic level. Our approach is to prepare well-defined heterogeneous catalysts using nanoparticle oxides with various shapes and sizes as supports and use different methods, including conventional precipitation-deposition and incipient wetness impregnation as well as atomic layer deposition, to deposit active metals onto these supports.

DAVID HIBBITTS, ASSISTANT PROFESSOR

Ph.D., 2012, University of Virginia

dhibbitts@che.ufl.edu

Heterogeneous Catalysis, Kinetic Studies, Density Functional Theory, Catalyst Synthesis and Characterization

Hibbitts' research group will combine kinetic and isotopic experiments with state-of-the-art density functional theory calculations to achieve an atomic-level understanding of heterogeneous catalysis.

The desired shift in the global energy economy from petroleum-based fuels to renewable resources will be made possible through the design of catalysts, including electro- and photo-catalysts. These catalyst materials enable the efficient conversion of feedstocks derived from biomass, natural gas, and other emerging resources into value-added fuels and chemicals. Key to the development of such catalysts is an understanding of how they behave at the molecular level, leading to structure-function relationships which improve catalytic processes and guide catalyst discovery.

Hibbitts' research group will combine multiple techniques to study a variety of chemical conversions of biomass and shale gas to attempt to reduce greenhouse gas emissions through the use of supported noble metal and zeolite catalysts.

PENG JIANG, PROFESSOR

Ph.D., 2001, Rice University

pjiang@che.ufl.edu

Self-Assembled Photonic Crystals and Plasmonic Crystals, Biomimetic Broadband Antireflection Coatings, Novel Stimuli-Responsive Shape Memory Polymers, Smart Window Coatings for Energy-Efficient Buildings

We are broadly interested in developing new chemical, physical, engineering and biological applications related to self-assembled nanostructured materials. Our current research is focused on the following four topics: Self-Assembled Photonic Crystals and Plasmonic Crystals; Biomimetic Broadband Antireflection Coatings; Novel Stimuli-Responsive Shape Memory Polymer; and Smart Window Coatings for Energy-Efficient Buildings.

LEWIS JOHNS, PROFESSOR

Ph.D., 1964, Carnegie Mellon University

johns@che.ufl.edu

Fluid Mechanics, Stability of Phase Boundaries

My work involves the stability of phase boundaries as one phase displaces another. Other areas of interest are electrodeposition, solidification, precipitation and other related phenomena.

DMITRY KOPELEVICH, ASSOCIATE PROFESSOR

Ph.D., 2002, University of Notre Dame

dkopelevich@che.ufl.edu

Self-Assembled Surfactant Systems, Stability of Biomembranes, Transport in Self-Assembled Systems

Our research focuses on theoretical and computational investigation of transport phenomena and non-equilibrium processes in nanoscale systems. We apply molecular dynamics and multi-scale simulations, as well as theoretical tools, to various nanoscale systems whose understanding is of significant scientific and technological importance.

ANTHONY LADD, PROFESSOR

Ph.D., 1978, University of Cambridge

ladd@che.ufl.edu

Complex Fluids, Soft Matter and Transport Phenomena

Our research focuses on the dynamics of systems at the micron scale; colloids, polymers, and other soft matter. The research combines the scientific disciplines of statistical mechanics and fluid dynamics with advanced computing to elucidate the key physical processes that underlie laboratory observations and measurements. Areas of application include statistical physics, biophysics and geophysics.

TANMAY LELE, ASSOCIATE PROFESSOR

Ph.D., 2002, Purdue University

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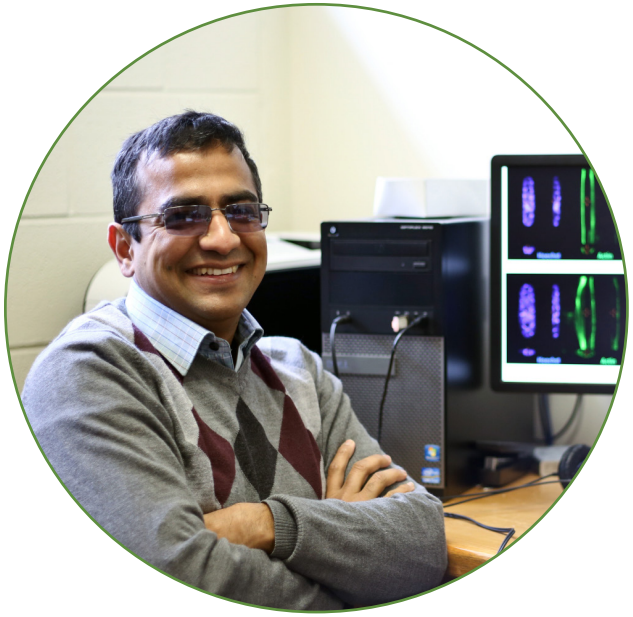
Supramolecular Complex Assembly, Physical Control of Cell Behavior, Nanobiotechnology



We are studying the molecular mechanisms of force generation in the cell cytoskeleton with a focus on nuclear forces. We are also interested in how cells sense and respond to micro-environmental mechanical cues and how cytoskeletal forces are altered in pathologies like cancer and muscular dystrophies; We are also developing novel materials for controlling cell adhesion; We have also developed new methods for analyzing protein binding interactions in living cells using a combination of mathematical modeling and fluorescence-based methods. We continue to refine these methods and apply them for developing a quantitative understanding of intracellular processes.

RANGA NARAYANAN, DISTINGUISHED PROFESSOR

Ph.D., 1978 Illinois Institute of Technology

ranga@che.ufl.edu

Interfacial Instability, Pattern Formation with Applications to Materials Science, Life Support and Space Enabling Operations

In the area of instabilities, it is the goal of the present research to examine the physics of the spontaneous generation of spatial patterns in processes that involve solidification, electrodeposition and free-surface convection. The mathematical methods used in our research are related to bifurcation theory, nonlinear energy methods and perturbation techniques. The experimental methods involve flow sensing by infrared imaging, shadowgraphy and electrochemical titration. Studies are also being conducted in transport phenomena as applied to regenerative life support. In this regard, the effect of pulsatile flow on mass and heat transfer is being investigated with the objective of enhancing transport and separation of species.

MARK ORAZEM, PROFESSOR

Ph.D., 1983, University of California, Berkeley

meo@che.ufl.edu

Electrochemical Impedance Spectroscopy, Energy Systems, Corrosion, Mathematical Modeling

Our group focuses on:

A combined experimental and modeling approach is being used to facilitate an in-depth understanding of the physical processes that control degradation and failure of lithium-ion battery systems. The objective is to use impedance spectroscopy to identify conditions that precede failure of lithium batteries.

2. A combined experimental and modeling approach is being used to improve under-standing of internal and external corrosion of pipelines used for transportation of oil and natural gas. Electrokinetic phenomena are being exploited to enhance separation of water from dilute suspensions of clay associated with phosphate mining operations.

3. Electrochemical impedance spectroscopy is an experimental technique in which sinusoidal modulation of an input signal is used to obtain the transfer function for an electrochemical system. Current projects include impedance of enzyme-based sensors for biological systems and development of impedance-based sensors to detect failure of segmentally constructed bridges.

CHANG-WON PARK, PROFESSOR

Ph.D., 1985, Stanford University

park@che.ufl.edu

Polymer Rheology and Processing

Our study in polymer rheology and processing focuses on investigating various multicomponent flows of polymeric fluids through an interplay between process modeling and experiment. Our current interest in multiphase flows is in the flow of gas-liquid mixture through a porous medium with a specific focus on a compact reformer system to generate hydrogen from a methanol-water mixture. Our research in this area is to develop a new design for a micro-reformer to produce hydrogen from hydrocarbon fuels that provides high efficiency in terms of conversion and thermal management, compactness and easy integration with the fuel cell for portability.

FAN REN, DISTINGUISHED PROFESSOR

Ph.D., 1991, Brooklyn Polytechnic Institute of Technology

ren@che.ufl.edu

Semiconductor Materials and Devices

Our group focuses on:

1. Wide energy-bandgap electronic devices- Contact metallization, passivation, device integration and characterization studies are routinely per-formed using state-of-the-art equipment. This work has been supported by the Office of Naval Research, the Electric Power Research Institute and the Defense Advanced Research Projects Agency.

2. Semiconductor device passivation aims to develop the basic science and technology of low-temperature deposition methods that can provide reliable and reproducible passivation for compound semiconductor devices, such as pseudomorphic AIGaAs/inGaAs/GaAs,PHEMTs, and more.

3. Three major topics under investigation: Deposition of silicon-nitride based dielectrics using different precursors such as SiH4/NH3, SiH4/N2, SiD4/N2, SiD4/ND3 and hydrogen-free dielectric and incorporation of a D, O, or N plasma treatment to reduce the occurrence of dangling bonds; Optimization of the dielectric material quality with different deposition techniques and conditions;and Characterization of device degradation mechanisms related to deposition techniques, dielectric film quality and the hydrogen passivation effect.

CARLOS RINALDI, PROFESSOR

Ph.D., 2002, Massachusetts Institute of Technology

carlos.rinaldi@bme.ufl.edu

Nanomedicine, Cancer Nanotechnology, Magnetic Nanoparticles, Colloidal Hydrodynamics, Transport Phenomena

My group studies the behavior and applications of suspensions of magnetic nanoparticles in applied magnetic fields. We combine expertise in synthesis and surface modification of magnetic nanoparticles; physical, chemical, and magnetic characterization; and modeling of the coupling of magnetic, hydrodynamic, and Brownian forces and torques to answer fundamental questions regarding the behavior of magnetic nanoparticle suspensions.

SPYROS SVORONOS, PROFESSOR

Ph.D., 1981, University of Minnesota

svoronos@che.ufl.edu

Modeling and Optimization of Biological, Chemical and Particle Processes

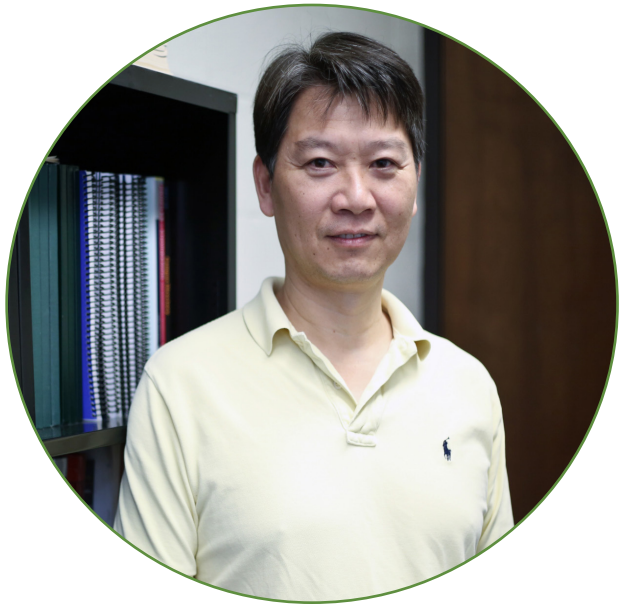
Our group focuses on biofuel production from saline cyanobacteria- Our research aims to establish a path for the economic production of a biofuel (methane) and an extracellular bioproduct. It utilizes a remarkable cyanobacterium that eliminates the need for fresh water inputs or external addition of nitrogenous nutrients and avoids expensive purification methods for product recovery. The project is in collaboration with Professor Pratap Pullammanappallil of the UF Agricultural and Biological Engineering Department and Professor Edward J. Phlips of the UF School of Forest Resources and Conservation.

YIIDER TSENG, ASSOCIATE PROFESSOR

Ph.D., 1999, Johns Hopkins University

ytseng@che.ufl.edu

Interactomics, Systems Biology Approaches and Molecular Biomechanics



Grounded in science and engineering fundamentals, research in my laboratory focuses on combining new engineering principles with advanced life- science methods for the purpose of developing a systematic, quantitative and integrative way to understand fundamental biological phenomena are the molecular and cellular levels. My research has implications on tissue engineering, wound repairs, microorganism invasions and disease states such as cancer metastasis.

SERGEY VASENKOV, ASSOCIATE PROFESSOR

Ph.D., 1994, Russian Academy of Science

svasenkov@che.ufl.edu

Transport in Porous Membranes, Single-file Diffusion, Separations of greenhouse Gases, Dynamics in Catalysts and Diffusion in Ionic Liquids

Our group focuses on:

1. Fundamentals of diffusion in membranes and catalysts with a hierarchy of pore sizes- A new diffusion NMR technique introduced by my group in collaboration with the National Magnet Lab, allows performing studies of gas transport on sub-micrometer and micrometer length scales in real-life membranes and catalysts.

2. Single-file diffusion in nanotubes- In my group, an application of high field and high gradient diffusion NMR enabled observation of SFD for gaseous sorbates.

3. In my group, a newly developed diffusion NMR technique was used to obtain first record of self-diffusivities of carbon dioxide inside RTILs by any type of microscopic technique.

JASON WEAVER, PROFESSOR

Ph.D., 1998, Stanford University

weaver@che.ufl.edu

Surface Chemistry of Metals and Metal Oxides, Reaction Kinetics and Catalysis and Oxide Thin Films

Our research focuses on advancing the molecular-level understanding of chemical reactions occurring on solid surfaces. Such reactions are fundamental to heterogeneous catalysis and semiconductor processing, yet remain poorly understood at the molecular level. We investigate surface chemical reactions using a wide array of analysis methods based on ultrahigh vacuum (UHV) surface chemistry and physics, including methods that provide information about surface reaction kinetics, adsorbed intermediates, atomic-scale surface structure and the chemical states of adsorbed molecules and atoms of the solid.

KIRK ZIEGLER, ASSOCIATE PROFESSOR

Ph.D., 2001, University of Texas at Austin

kziegler@che.ufl.edu

Nanomaterial Interfaces

Our group focuses on:

1. Developing a fundamental understanding of interfaces in nanoscale systems, which can have far-reaching implications to various fields of nanotechnology.

2. Manipulating Interfaces- In the field of single walled carbon nanotubes (SWCNTs), we have exploited the natural sensing capabilities of the nanotubes to help us characterize the localized environment surrounding them.

3. Controlling reactions and transport at surfaces- Our group develops nanomaterial interfaces that help control biological function or accessibility, enhance the collection of photons, improve charge transport, yield better heat transfer, and generate more plasma.

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