DREXEL UNIVERSITY
The Department of Chemical & Biological Engineering
GRADUATE STUDIES

>> drexel.edu/cbe
14
Full-Time Tenure-Track/Tenured Professors

39
Ph.D Students

8
Masters Students

450
Undergraduate Students

$2.5 Million
Research Expenditures in 2014

73
Active Grants

GRADUATE PROGRAMS:
Ph.D. & M.S. Degrees in Chemical Engineering

FUNDING YOUR EDUCATION
All Full-Time PhD Students Admitted Receive:

A Monthly Stipend
100 Percent Tuition Payment
Optional Insurance Plan

GRADUATE FELLOWSHIPS AVAILABLE

GAANN Fellowships
George Hill, Jr. Fellowships
Koerner Family Fellowships
The Harry Brown, Jr. Fellowships
The Leroy Resser Fellowship Fund
Graduate Scholarships
The Department of Chemical and Biological Engineering at Drexel University consists of 14 tenured and tenure-track faculty members, 2 teaching faculty, 39 PhD students and 450 undergraduate students. We are currently engaged in externally funded research with over $2.5 million in annual research expenditures using state-of-the-art facilities. Our research program is built upon the following areas of core competency: (a) chemical kinetics, transport, and thermodynamics (b) polymer science and engineering and (c) systems engineering, modeling and computation. These competencies support our research themes of Energy and Sustainability and Health and Medicine which are directly linked to solving present-day societal challenges. Funding sources for our research include NSF, NIH, ARO, AFOSR, ONR, DOE, USDA, EPA and NASA. Recently, we were awarded a three-year $4 million Center for Sustainable Corrosion Protection by the Army Research Laboratory, and we are an Army Materials Center of Excellence for polymers research. Additionally, our faculty have received multiple young investigator awards, including 7 CAREER Awards and 1 PECASE award.
FACULTY RESEARCH INTERESTS:

**Cameron Abrams**  
Biomolecular simulations  
HIV structural biology and inhibitor design

**Raj Mutharasan**  
Biomolecular binding and interactions  
Biosensors  
Bioprocess Engineering

**Nily Dan**  
Biological colloids  
Biomembranes  
Drug delivery systems

**Steven Wrenn**  
Biomedical colloids  
Biological membranes  
Ultrasound with colloids, membranes, and cells

**FACULTY RESEARCH INTERESTS:**

**ENERGY & THE ENVIRONMENT ENGINEERING**

**Nicolas Alvarez**  
Aqueous lubrication  
Fracking fluids

**Kenneth Lau**  
Polymer electrolytes  
Conducting polymers  
Solar cells, supercapacitors, batteries

**Richard Cairncross**  
Biodegradable polymers  
Renewable fuels and energy  
Biodiesel production

**Giuseppe Palmese**  
Renewable polymeric materials  
Renewable sources

**Jason Baxter**  
Solar cells  
Semiconductors  
Ultrafast spectroscopy

**Joshua Snyder**  
Corrosion: dealloying  
Electrocatalysis  
Gas to liquid fuels

**Aaron Fafarman**  
Solar cells  
Colloidal nanocrystals  
Self-assembly of materials

**Masoud Soroush**  
Fuel cells, solar cells, rechargeable batteries  
Desalination membranes

**Vibha Kalra**  
Electrodes for energy devices  
Batteries, supercapacitors  
Fuel cells, solar cells

**Maureen Tang**  
Batteries and fuel cells  
Electrocatalysis  
Electrochemical engineering
MULTISCALE MODELING & PROCESS SYSTEMS ENGINEERING

PROCESS CONTROL AND MODELING I TRANSPORT PHENOMENA I MOLECULAR SIMULATIONS I BIOPHYSICS I COMPLEX FLUIDS

FACULTY RESEARCH INTERESTS:

Cameron Abrams
Multiscale molecular simulations
Free-energy methods

Richard Cairncross
Transport modelings

Nily Dan
Complex fluids
Gene and drug delivery

Vibha Kalra
Molecular/meso-scale simulations
Self assembling nano-scale materials

Masoud Soroush
Multiscale modeling
Probabilistic modeling and inference
Control and optimization

Maureen Tang
Electrochemical engineering

POLYMER SCIENCE & ENGINEERING

MEMBRANES I COMPOSITES I REACTING POLYMER SYSTEMS I POLYMER PROCESSING & RHEOLOGY I NANOCOMPOSITES I INTERFACIAL PHENOMENA I DIFFUSION IN POLYMERS I POLYMER THERMODYNAMICS

FACULTY RESEARCH INTERESTS:

Cameron Abrams
Polymer physics and molecular simulations
Thermosetting polymers and composites

Nicolas Alvarez
Polymer extensional rheology

Richard Cairncross
Transport in polymers
Biodegradable polymers
Coatings

Nily Dan
Polymers nanocomposites

Vibha Kalra
Self assembling polymers
Organic/inorganic hybrids

Kenneth Lau
Polymer thin films/devices
Chemical vapor deposition
Surface engineering

Giuseppe Palmese
Reacting polymer systems
Nanostructure polymers
Materials from renewable sources
Composites and interfaces

Masoud Soroush
Reactor optimization & control
Polymer reaction engineering
Computational quantum chemistry

Vibha Kalra
Multiscale molecular simulations
Free-energy methods

Richard Cairncross
Transport modelings

Masoud Soroush
Multiscale modeling
Probabilistic modeling and inference
Control and optimization

Maureen Tang
Electrochemical engineering
**CAMERON ABRAMS**  
**Degrees**  
PhD, Chemical Engineering, University of California, Berkeley, 2000  
BS, Chemical Engineering, North Carolina State University, 1995  

**Selected Awards**  
College of Engineering Excellence in Research Award, 2014  
NSF CAREER Award, 2006  
Office of Naval Research Young Investigator, 2003  

**Research Interests**  
Molecular simulations in biophysics and materials  
HIV-1 envelope structure and function  
Protein-ligand binding thermodynamics and kinetics  

**Selected Publications**  

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**NICOLAS ALVAREZ**  
**Degrees**  
PhD, Chemical Engineering, Carnegie Mellon University, 2011  
BS, Chemical Engineering, University of Florida, 2006  

**Selected Awards**  
AIChE Fluid Dynamics (01J) First Place Postdoctoral Award, 2012  
The Ken Meyer Award for Excellence in Graduate Research, 2011  
AIChE Fluid Dynamics (01J) First Place Graduate Poster Award, 2010  
Geoffrey D. Parfitt Memorial Award, 2010  
Mark Dennis Karl Outstanding Graduate Teaching Award, 2010  
NSF Graduate Research Fellowship, 2006  

**Research Interests**  
Photonic crystal defect chromatography  
Extensional rheology of polymer/polymer composites  
Surfactant/polymer transport to fluid and solid interfaces  
Aqueous lubrication  
Interfacial instabilities  

**Selected Publications**  

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**JASON BAXTER**  
**Degrees**  
PhD, Chemical Engineering, University of California, Santa Barbara, 2005  
BS, Chemical Engineering, University of Delaware, 2000  

**Selected Awards**  
NSF CAREER Award, 2009  
ACS PRF Alternative Energy Postdoctoral Fellowship, 2005  
NSF Graduate Research Fellowship, 2001  

**Research Interests**  
Solar cells  
Semiconductor and oxides  
Ultrafast spectroscopy  

**Selected Publications**  
Degrees
PhD, Chemical Engineering, University of Minnesota, 1994
BS, Chemical Engineering, University of Rochester, 1989

Selected Awards
Fulbright Lectureship at University of El Salvador, 2010
L.E. Scriven Young Investigator Award, 2006
PECASE Award, 1996

Research Interests
Biodiesel production
Sustainability
Waste to energy systems
Biodegradable polymers and composites

Selected Publications
Stacy, C.J.; Melick, C.A.; Mohammed, M.; Cairncross, R.A. Esterification of free fatty acids to fatty acid alkyl esters in a bubble column reactor for use as biodiesel. *Fuel Processing Technology* 2014, 124, 70-77.


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Degrees
PhD, Chemical Engineering, University of Minnesota, 1992
BS, Chemical Engineering, Technion IIT, Israel, 1987

Selected Awards
NSF-BIO/DBI Service Appreciation, 2009-2010
Visiting Scholar, DEAS Harvard University, 2006
NSF Young Investigator CAREER Award, 1999

Research Interests
Self assembly in amphiphilic and polymeric systems
Controlled drug release from polymer-based carriers

Selected Publications


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Degrees
PhD, Physical Chemistry, Stanford University, 2010
BS, Chemistry, University of California, Berkeley, 2000

Selected Awards
Annual Prize in Physical Chemistry, Stanford University, 2010
Linus Pauling Chemistry Teaching Award, Stanford University, 2010

Research Interests
Photovoltaic energy conversion
Solution-based synthesis of semiconductor thin films
Colloidal nanocrystals
Electromodulation and photomodulation spectroscopy

Selected Publications


VIBHA KALRA
Assistant Professor

Degrees
PhD, Chemical and Biomolecular Engineering, Cornell University, 2009
BS, Chemical Engineering, Indian Institute of Technology (IIT), Delhi, India, 2004

Selected Awards
ONR Summer Faculty Fellowship Award, 2013
NSF CAREER Award, 2012
Faculty Career Development Award, Drexel University, 2011
Austin Hooey Research Excellence Award, Cornell University, 2009

Research Interests
Electrodes for energy storage and conversion
Supercapacitors, Li-S/O, batteries, fuel cells, flow batteries
Electrospinning of nanofibers
Molecular dynamics simulations

Selected Publications
Tran, C.; Kalra, V. Fabrication of porous carbon nanofibers with adjustable pore sizes as electrodes for supercapacitors. J Power Sources 2013, 235, 289.


KENNETH LAU
Associate Professor

Degrees
PhD, Chemical Engineering, Massachusetts Institute of Technology, 2000
BEng(Chem), National University of Singapore, 1995

Selected Awards
Sabbatical Leave Award, 2013 (HKUST)
NSF CAREER Award, 2008
ACS PRF-New Investigator Award, 2008

Research Interests
Polymer thin films and devices
Energy capture (solar cells)
Energy storage (supercapacitors, batteries)
Surface engineering (superhydrophobicity, superhydrophilicity)

Selected Publications

RAJ MUTHARASAN
Frank A. Fletcher Professor

Degrees
PhD, Chemical Engineering, Drexel University, 1973
MS, Chemical Engineering, Drexel University, 1971
BS, Chemical Engineering, IIT (Madras, India), 1969

Selected Awards
Fellow of The American Association for the Advancement of Science, 2011
Fellow of the American Institute for Medical and Biological Engineering, 2006
Fellow of the American Institute of Chemical Engineers, 2002
Editorial board of Applied Biochemistry and Biotechnology

Research Interests
Cantilever sensors for biological detection
Modeling of resonance
Dynamics of fluid-solid interactions
Mechanics and related phenomena in biological binding and interaction

Selected Publications
Degrees
PhD, Chemical Engineering, University of Delaware, 1992
BS, Chemical Engineering, Princeton University, 1986

Selected Awards
- Faculty Achievement Award for Excellence in Teaching, Drexel University, 1999
- O. Hugo Schuck Best Paper Award, AACC, 1999
- NSF Faculty Early CAREER Award, 1997

Research Interests
- Polymerization reaction engineering
- Process systems engineering
- Solar cells, fuel cells and power storage systems
- Probabilistic risk assessment and mitigation

Selected Publications

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Degrees
B.S. Chemical Engineering, Drexel University, 2006
M.S. Chemical Engineering, Drexel University, 2006
Ph.D. Chemical Engineering, Johns Hopkins University, 2012

Selected Awards
- Director’s Postdoctoral Fellowship Award, Argonne National Lab, 2012
- Poster Award: 1st Place, ECS Meeting, 2008
- Undergraduate Student Research Award, Drexel University, 2006

Research Interests
- Electrocatalysis (energy conversion/storage)
- Heterogeneous catalysis
- Corrosion (dealloying, nanoporous metals)
- Colloidal synthesis
- Interfacial electrochemical phenomena in nanostructured materials

Selected Publications
- Snyder, J.; McCue, I.; Livi, K.; Erlebacher, J. Structure/Processing/Properties relationships in nanoporous nanoparticles as applied to catalysis of the cathodic oxygen reduction reaction. Journal of the American Chemical Society 2012, 134, 8633-8645.

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Degrees
PhD, Chemical Engineering, Massachusetts Institute of Technology, 2000
BEng(Chem), National University of Singapore, 1995

Selected Awards
- Army Materials Center for Excellence, 2006-2014
- TTCP Technical Program Achievement Award, 2007
- SERDP Best Project Award, 2005

Research Interests
- Thermosetting polymers and biomaterials
- Composites and interfaces
- Processing-structure-property relationships

Selected Publications
FACULTY PROFILES

MAUREEN TANG
Assistant Professor

Degrees
Ph.D. Chemical Engineering, University of California, Berkeley, 2012
B.S. Chemical Engineering, Carnegie Mellon University, 2007

Selected Awards
Electrochemical Society Daniel Cubiciotti Student Award, 2011
NSF East Asia Pacific Summer Institute Fellowship, 2011
National Science Foundation Graduate Research Fellowship, 2007-2010

Research Interests
Electrochemistry (batteries, fuel cells, electrolyzers)
Catalysis and surface science

Selected Publications
Tang, M.; Hahn, C.; Klobuchar, A.; Ng, J.W.; D.; Wellendorff, J.; Bligaard, T.; Jaramillo, T.F.
Nickel-silver alloy electrocatalysts for hydrogen evolution and oxidation in alkaline electrolyte.

STEVEN WRENN
Associate Professor

Degrees
PhD, Chemical Engineering, University of Delaware, 1999
MChE, Chemical Engineering, University of Delaware, 1996
BS, Chemical Engineering, Virginia Tech, 1991

Selected Awards
Cooperative Education Faculty of the Year, 2012
Alexander von Humboldt Research Fellow, 2006
NSF CAREER Award, 2004
Whitaker Foundation Biomedical Engineering Research Grant, 2001

Research Interests
Ultrasound-triggered drug delivery
Biological colloids and membranes
Atherosclerosis and gallstone pathogenesis

Selected Publications
Nguyen, A.; Wrenn, S. Acoustically active liposome-nanobubble complexes for enhanced ultrasonic imaging and ultrasound-triggered drug delivery.
WIREs Nanomedicine and Nanobiotechnology 2014, 6, 316 – 325.


Philadelphia financier and philanthropist Anthony J. Drexel, mentor of J.P. Morgan, founded Drexel University in 1891. Today, Drexel University is a top-tier comprehensive research university ranked in the top 100 of American’s Best National Universities by US News and World Report. Recently, Drexel has been acknowledged for the most promising and innovative changes in academics, faculty, students, campus, and facilities, in the nation. Drexel is widely recognized for its focus on experimental learning through its cooperative education program, technology and translational research. Drexel University enrolls more than 22,000 students, is the nation’s 14th largest private university, and has the largest private college of engineering in the nation.

**CONTACT INFORMATION:**
For more information about the graduate program in Chemical Engineering at Drexel University, contact us at: www.drexel.edu/cbe/contact/contact-us/

**ADMISSIONS INFORMATION:**
Graduate Admissions:
www.drexel.edu/grad/

Apply online:
www.drexel.edu/grad/apply/online-app/

**DREXEL’S ADMISSION REQUIREMENTS:**
Acceptance to graduate study requires:
A four-year bachelor’s degree from an accredited institution in the United States or an equivalent international institution.

A minimum cumulative grade point average of 3.0 (B) for the last two years of undergraduate work. The average for any graduate work must be at least 3.0.

Applicants for post-master’s status must show potential for further study by having maintained at least a 3.0 average in their master’s level studies.

The admission committee evaluates all credentials submitted by applicants to determine a student’s ability and potential to contribute to his/her program of study and to the University community as a whole.
Drexel University is located in the heart of Philadelphia, the 6th largest city in the United States. Philadelphia is vibrant city that has the second-largest student concentration on the East Coast with over 420,000 college and university students enrolled in the greater metropolitan area. Philadelphia is a culturally rich city boasting some of the country’s best museums, restaurants, orchestra, sports teams, tourist attractions, parks, hospitals, and cultural events.

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