From the Department Head

We are pleased to send you our annual UMass Amherst Chemical Engineering newsletter. I think you will find many exciting developments taking place in the department and hope you enjoy reading about the progress and accomplishments. We are systematically implementing several key strategies, which I have briefly summarized below. I would particularly like to recognize generous contributions from our alumni, which allowed us to establish a completely new undergraduate biotechnology laboratory which is already up and running. Please feel free to reach out or visit at any time!

Key strategies and progress

Our undergraduate enrollment has quadrupled in the last 15 years, reflecting strong interest in the major and success in the job market. In order to address the growing student population we have hired three outstanding new faculty members (please see bio sketches later in the newsletter) all three of whom are outstanding teachers as well as researchers. We are currently searching for three additional new faculty, two junior and one endowed senior position. Our new faculty are plugged into new College of Engineering mentoring workshops and one on one departmental mentoring to help them navigate the intricacies of UMass teaching and research infrastructure and processes.

These outstanding new faculty hires enable us to more fully address student needs, ensure teaching continuity, offer additional specialized elective courses and broaden hands-on laboratory opportunities for undergraduate and graduate students alike. For example, we are introducing a sophomore level experimental methods course, a mathematical methods elective, new biotechnology offerings and enhanced our professional skills and development training. In the future we will expand our elective offering in the areas of catalysis, energy engineering and colloid / interfacial science.

(continued next page)
Department Head, continued

Significantly, our alumni have generously funded a completely new biotechnology laboratory, which is now up and running with 25 students under the leadership of Prof. Forbes and will be expanded next year. We are investing in equipment upgrades, equipment maintenance and new experiments for the senior lab. All of these activities have helped "catalyze" the university to invest in renovations of the senior laboratory – a much needed and long overdue upgrade. We have enhanced our advising program, developed multi year teaching plans to help ensure coverage and are supporting Teaching Assistantships to focus on undergraduate teaching and mentoring.

UMass Chemical Engineering has one of the most productive graduate programs in the country on a per-faculty basis. However, our program has been relatively small in comparison to other major programs. Perhaps the biggest boost to our Graduate program is the hiring (and future hiring) of outstanding young faculty with robust research programs in cancer biotechnology, advanced materials and synthetic biology. Beyond this, we have implemented a high quality, thesis-based Masters program which is attracting some truly outstanding students. These students may wish to go on to PhD programs or go work directly in industry. We have also established a mechanism to fund first year graduate students – before they start to engage fully in research. We have received generous contributions from alumni to support select research and teaching assistantships in years 2 through 4 and a generous "mini-endowment" to support the work of one of our junior faculty. We have also secured and are renovating laboratories in Goessmann for faculty and student research and are in the midst of developing a cross-campus Materials Science and Engineering graduate program, which capitalizes on the strength of UMass in this area. And, we are actively broadening and enhancing our industry collaborations with the help of our alumni network.

Going forward, we are pivoting our senior laboratory fund-raising effort to secure new equipment for Materials and Process related experiments. We have requested university support to further enhance our instructional and advising capacity, and we are ramping up our communication and outreach to current and prospective industrial partners. We will continue to push forward aggressively on ongoing hiring, facilities renovation and alumni engagement efforts.

Hopefully you enjoy this newsletter and a big thanks for all the help, support and advice from our Alumni in the past year!

John Klier
Professor and Department Head
Chemical Engineering
New Experiment in Senior Lab: Gas Absorption in a Packed Tower

With the help of generous support from alumni, the Chemical Engineering Laboratory has added a new experimental station. The theme of the experiment is gas absorption in a packed tower; and the station adds to the lab’s separation portfolio, which already includes distillation, membrane separation and chromatography. The heart of the experiment, which was designed and constructed by Lecturer Dr. Rolf Jentoft and Technical Specialist Gary Czupkiewicz, are four feet high and 6 inch wide towers, each containing a different type of packing. The towers are used for the absorption of CO₂ from air into water. Senior students investigate the pressure drop and mass transfer characteristics by varying gas and liquid flow rates, CO₂ partial pressure, total pressure, and packing type. One tower is transparent to allow student to observe various types of flow

TO ALL OUR DONORS, THANK YOU!

Generous contributions to our senior lab have allowed us to create three new experiments

New Biotechnology Laboratory created by Neil Forbes

This laboratory teaches many of the core skills utilized in modern life science research and manufacturing. The experiments are grouped into three sections: gene cloning, fermentation and protein purification. These three sections parallel the process of bringing a biological product to market. These concepts are important steps in the biological drug development pipeline and are important for the pharmaceutical and biotech industries. The first section (gene cloning) covers many of the core basic skills in modern molecular biology. In this section, the gene for green fluorescent protein (GFP) is cloned into a plasmid and transformed into Escherichia coli. In the second section, cultures of transformed bacteria are grown in fermenters and the GFP protein will be expressed. In the third section, the GFP protein is isolated and analytical techniques are used to confirm that it was produced. The core skills taught in this laboratory are: (Cloning Section I) PCR, electrophoresis, DNA purification, restriction digest, ligation, transformation, and PCR screening; (Fermentation Section II) bacterial growth, media formulation, oxygenation, sterile procedure, induction of protein expression; (Protein Purification Section III) cell lysis, protein chromatography, the Bradford Assay, polyacrylamide protein electrophoresis, immunoblotting, and gel imaging. Learning these skills is essential to prepare for a career in basic research or the life science industry.

Going with the flow: Alumnus creates experiment for senior lab

The senior lab is benefiting from a new fluid flow experiment provided thanks to generous alumni donations. Constructed and commissioned in 2015, the “Fluid Flow” experiment exposes students to a myriad of concepts. In the three years of operating the experiment, students have evaluated centrifugal pump performance (pump head vs. flow curve) factoring in pipe frictional head losses, checked orifice plate/venturi meter calibration, determined control valve installed/inherent characteristics, and quantified flow meter permanent head loss. The experiment is not limited to incompressible liquid flow; students have also investigated gas/liquid flow regime maps (the dread slug flow!), and gas flow considerations such as subsonic, sonic, and supersonic flow. Designed by a CHE alumnus after initiating a successful fundraiser (in excess of $100,000 raised to build “Fluid Flow” and “Gas absorption in packed columns” mentioned above), “Fluid Flow” was designed to ensure students would be exposed to hands on fluid mechanics, especially considering that nearly all retrofit and new construction projects require design of fluid flow equipment and nearly all facilities contain fluid flow equipment integral to the process.
Undergraduate Highlights...

Rising Researchers in 2016/2017

Brandon Johnston ‘18

Chemical engineering major and Commonwealth Honors College student Brandon Johnston ‘18 is conducting experimental research investigating the basic principles of self-assembly in charged polymer systems. His efforts have increased the field’s understanding of the ways in which polymer architecture can be used to drive self-assembly. Self-assembly can be harnessed to expand the use of a dense, polymer-rich liquid phase called coacervate, which is used in polymer-based materials applications ranging from sensors to catalysis to medicine.

While these types of materials have been commonly used in the food, cosmetics, and fragrance industries for years, a basic understanding of their self-assembly is still limited. Johnston has been working in collaboration with polymer science and engineering professor Todd Emrick and his group to synthesize a portfolio of highly controlled “comb” polymers with different chemical compositions. Johnston then utilizes these materials to investigate the effects of polymer architecture composition on complex coacervation.

This past spring, Johnston compiled the results of his studies on polymer architecture as the lead author on a peer-reviewed manuscript that was recently published in Organic and Biomolecular Chemistry and has two other manuscripts in the works. Johnston has been honored with three separate Commonwealth Honors College Research Assistant Fellowships, as well as an Honors Research Grant to support his thesis research this year.

Johnston’s research advisor, Assistant Professor Sarah Perry, says “Brandon’s leadership in my research group has been a critical asset over the past three years. He is by far the strongest undergraduate researcher of the more than forty students that I have had the pleasure of working with.”

Ashley Kaiser ‘17

Ashley Kaiser ‘17 is a star, “at the top of her class” according to Professor Christos Dimitrakopoulos. The chemical engineering major, competitive gymnast, and Commonwealth Honors College student has been heavily involved in the research occurring in Dimitrakopoulos’s graphene lab since her first year on campus. She has also claimed a top spot in the two chemical engineering classes he teaches.

“Ashley is a seasoned team player and possesses a corporate-like demeanor of responsibility and accountability, uncharacteristic of her age. She has done summer internships at the 3M Research and Development Laboratory and at MIT. Her focus is razor sharp, her intellect superior, her determination unflappable, and her drive relentless. She is also always willing to help and is the first to volunteer for the task at hand,” says Dimitrakopoulos.

Commonwealth Honors College student Robert Johnston ‘17, a double major in physics and chemical engineering from Pepperell, Massachusetts, spends his time working on experimental nuclear physics. He’s currently investigating ways to measure how much a sub-atomic particle, called the “pion,” stretches when you apply an electric field to it. The experiment, says Rory Miskimen, professor of physics and Johnston’s research advisor, will help us understand the fundamental symmetries of nature that are responsible for the presence of complex nuclei in the universe.

Johnston has been leading the effort to design and construct prototype multi-wire proportional chamber (MWPC) detectors, which range in size from 10 to 20 inches. He’s been working on the mechanical design and construction of the electronics used to read small electrical currents caused by the passage of subatomic particles on the detector.

Kaiser is currently working on her Commonwealth Honors College thesis project, “Low-Temperature Graphene Growth by Plasma-Enhanced Chemical Vapor Deposition,” which Dimitrakopoulos believes has the potential for high impact. Her work in the graphene lab has already spawned a number of posters, conference presentations, and coauthored papers.

While she is leading her personal project, Kaiser is an invaluable member of the broader graphene team, says Dimitrakopoulos. “She has voluntarily undertaken the role of the record keeper, the person that organizes the data and writes 40-50-page progress reports to facilitate the team’s understanding of the experimental data, and the strategic planning of future experiments. She is a skilled scientific report writer. It is no surprise that she has been accepted to all graduate programs she applied for, including MIT,” says Dimitrakopoulos. (Note: Ashley began her Ph.D. studies at MIT in fall 2017)

“Our detector electronics utilize a ‘trans-impedance’ amplifier circuit. It was Bobby’s job to design the printed circuit board (PCB) used to carry the electronic components, to install the components on the PCB, and then to test the assembled electronics. He is now finalizing our electronics design, and is getting the final CAD files ready for PCB manufacturing and assembly,” says Miskimen.

Although Johnston had limited electronics experience when he began his research, Miskimen notes he was able to quickly pick up those skills by interacting with other students and by teaching himself. “Bobby’s a fast learner and one of the strongest students I’ve had in my lab. His level of expertise and accomplishment are unparalleled for an undergraduate, at a level usually seen in master’s-level electrical engineers and PhD-level physicists working in national laboratories,” says Miskimen. (Note: Bobby began his PhD. studies at MIT in fall 2017)
On April 5, 2017, Chemical Engineering (ChE) major Cory Thomas of Tewksbury, Massachusetts, was honored as the 2017 UMass Amherst Male Winter Scholar-Athlete. During his highly productive undergraduate education at UMass Amherst, Thomas has run several of the fastest times in the history of the university, maintained a 3.2 GPA, completed two demanding internships, and devoted himself to pursuing a pharmaceutical engineering career motivated by his mother’s spirited fight to overcome cancer.

“Cory is one of those unique types that is inspiring to everyone he meets, including his college professors,” said ChE Professor Shelly Peyton at the awards ceremony on April 5. “It’s been inspiring these last couple of years to watch his creativity, his ingenuity blossom…and knowing how many directions he’s been pulled in by his [family’s problems] and obviously being great on the track. And I think it’s obvious that Cory is one of these people that’s going to change the world someday.”

Thomas (’17) majored in Chemical Engineering with a concentration in Biochemical Engineering. He is enrolled in the Master’s of Pharmaceutical Sciences program at UMass Lowell to develop a more well-rounded education for a career in process development. His academic focuses are in biochemistry and bioengineering and his industrial experience is in downstream process development.

On the track Thomas is one of the best middle-distance runners ever to compete for UMass Amherst. He has run the mile in 4:07.78 (fourth fastest in UMass history) and so far has excellent marks of 3:52 in the 1500 meters and 1:52 in the 800 meters. Check at 2:52 on this YouTube Video.

https://www.youtube.com/watch?v=piilwoiPQ9E

(Cory is now in a Master’s Program at Umass/Lowell)

Several of our Chemical Engineering Students manage to squeeze in Marching Band or play a Sport

Marching Band:
Thomas Denham ’20 and Dhiren Mistry ’21 (pre-engineering students)

Athletics:
Aiste Balciunaite ’18, Rowing
Sarah Gillece ’19, Track
Luther Gordon ’20, Swimming
Kelly Małyszka ’21, Swimming
Adam Selsman ’18, Cross Country and Swimming
Anthony Reale ’18, Lacrosse

(Is your name missing? Email Amity (lee@umass.edu)

To see the latest Chemical Engineering News, check out che.umass.edu/news/
Several deeply committed UMass Students didn’t want to let the water crisis in Puerto Rico go unchecked! A five-person interdisciplinary team, which included three engineering majors, won four prizes at the HackUMass hackathon on November 3 through 5 by creating LiveWaterMap, invented to counteract the devastation and resultant water shortage and contamination caused by Hurricane Maria in Puerto Rico. As the team explains its product, “LiveWaterMap is an online web service that collects and maps water quality data using GPS and time data - information that can be easily understood and made available for anyone, anytime, anywhere.”

“In the case of Puerto Rico, LiveWaterMap is meant to be employed by aid workers, community leaders, and local authorities who are dealing with the water emergency. The prize-winning team goes on to say that the “Low-cost, open-source, modular, Arduino-based water sensors can easily be configured to send geotagged and timestamped data on four different parameters (pH, dissolved oxygen, conductivity, and temperature) that can be interpreted to determine if a water source is likely to be contaminated or not.”

The members of the prize-winning team are Leah Leshchinsky (Mechanical and Industrial Engineering), Bryan Chua (Environmental Science and Chemical Engineering), Roy Chan (Computer Science), Dat Duong (Pre-Engineering/Computer Science), and Jonathan Royce (Mathematics).

As a result, the team members explain, “Puerto Rican students and employees at UMass Amherst were greatly concerned. Among them was Hector Luis, who approached Bryan Chua from the registered student organization, Sustainability Projects Abroad (SPA), to begin planning a disaster relief and community development trip to Puerto Rico from January 2nd to 14th, 2017. SPA sent a team not just to win HackUMass V, but to build a working prototype of LiveWaterMap, an urgent solution that will aid local authorities and community leaders in locating, assessing, and remediating contaminated water sources, so that millions of lives in Puerto Rico and other disaster-hit regions around the world will be saved.”

The water data can also be automatically uploaded onto a Google Map API on LiveWaterMap.tech, which allows members of the public to access and see if the water sources around them are contaminated or not according to EPA regulations. It provides much-needed information on which water sources should be avoided, remediated, and filtered for safe water consumption or used for other purposes like cooking, bathing, or laundry.
Sarah Perry and Students Chosen as Finalists in MRS Science as Art Competition in Phoenix

Prior to the 2017 Materials Research Society (MRS) Spring Meeting and Exhibit, Professor Sarah Perry and two of her undergraduate students submitted a piece of scientifically related art work that was selected as a finalist for the MRS Science as Art competition, whose purpose was to show the aesthetic beauty of scientific images. Perry’s participating students are Savannah Szemethy (’19) and Matthew Gagnon (’17, mathematics). Szemethy and Gagnon’s MRS submission, titled Bloom, is a micrograph of DNA/lipid films that was recolored into an image of blooming flowers (see accompanying image).

“Unfortunately, we didn’t win best in show,” said Perry following the meeting, “but it was still really awesome that we were chosen as finalists.” The image was on display for judging throughout the 2017 MRS Spring Meeting.

Bloom — scanning electron micrograph of flower-like structures observed on DNA/lipid films for surface-mediated transfection
This Spring Break, four Chemical Engineering students from the University of Massachusetts of Amherst went to New Orleans, painting and repairing houses. They joined two teams of 14 students from UMass Amherst and around 50 students from the Five College area as part of Intervarsity Christian Fellowship’s annual ServeUP New Orleans trip where students of diverse racial, religious, and sociopolitical backgrounds come together to explore the intersection of faith, social justice, and racial reconciliation while rebuilding the city recovering from Hurricane Katrina. Many of us who went for the second time for ServeUP New Orleans were actually disappointed that we did not get to build houses from the ground up as we did with Habitat for Humanity and AmeriCorps last year. Interestingly, every year, the projects get easier and easier as the city gets more and more rebuilt. Although we had less physical work, this year, I felt we had more time to talk to the locals who lived in a part of the city where shootings, killings, and burglaries happened rather often. — Bryan Chua ’19

Five students from the University of Massachusetts Amherst raised enough money to visit Puerto Rico from January 2 to 14 and carry out an intensive campaign of water purification, water contamination education, the distribution of food and medical supplies, and other forms of physical and emotional support for the ravaged island.

The students represented Sustainability Projects Abroad (SPA), a registered student group at the University of Massachusetts Amherst whose mission is “to plan and facilitate student-led disaster relief and community development projects to green the campus and serve the world abroad.”

With several thousand dollars raised from a Gofundme online campaign, the SPA group was able to purchase 100 Hollow Fiber Membrane water filters, provided by the aid group Filter of Hope. “On January 2 to 14,” said the students “we were on the ground in Puerto Rico partnering with local aid workers and community leaders to survey water quality, train locals on how to use Hollow Fiber Membrane water filters, and employ LiveWaterMap, an online website for crowdsourcing and mapping water quality for everyone, everywhere.”

Besides installing the 100 water filters, the SPA group worked with the We Care Project (a Puerto Rican disaster-relief organization inspired by the three devastating hurricanes in the fall of 2017) to distribute food and medical supplies to several of the least-reached Puerto Rican communities, including Cidra, Jayuya, and Yabucoa.

Three of the five-person SPA delegation were engineering students: senior civil engineering major Nicolas Duenas and junior chemical engineering majors Bryan Chua and Ricardo Valdez. Also joining them were Natalia Dilan, a junior accountancy and psychology major, and Hector Luis Carasquillo, a junior majoring in sustainable community development. Valdez, Dilan, and Carasquillo are Puerto Rican Americans whose families were personally affected by the hurricane.
Undergraduate Organizations

American Inst. of Chemical Engineers (AIChE)

The UMass Amherst student chapter of AIChE (American Institute of Chemical Engineers) began as a club with only a handful of professionally focused student members, and is now the premier chemical engineering organization on campus. Their focus is two-pronged: striving to unite the classes at the University of Massachusetts Amherst through fun and engaging social events and also provide students with knowledge about industry, the field of chemical engineering, current scientific research, and their options for higher education.

Intern. Society for Pharmaceutical Engin. (ISPE)

The UMass Amherst student chapter of International Society for Pharmaceutical Engineering (ISPE) is a bridge between UMass students and the biotechnology and pharmaceutical industries. The UMass chapter is part of the network of Boston Area ISPE chapters. This network gives students many opportunities to connect with companies and other students in New England.

Tami Paluca Receives 2017 Dean’s Service Award in the College of Engineering

Tami Paluca, the academic advisor for undergraduate studies and the director of alumni affairs in the Department, is the 2017 winner of the Dean’s Service Award in the College of Engineering. “Tami is dedicated to undergraduate advising and oversees many vital aspects of the student experience for ChE,” said Dean Tim Anderson. “Highly regarded by students and faculty, she is known for her excellent advice, tireless work, and deep concern for the well-being of our undergraduates. Tami has proven indispensable as we navigate our way through the significant enrollment increase in the department.”

The honor adds to the awards hardware that Paluca received in 2015, when she received the Staff Appreciation Award from the Center for Multicultural Advancement and Student Success for “dedication and invaluable contributions to CMASS and the UMass community this year.” In 2012, she was also the recipient of the UMass Amherst Residential First-Year Experience Student Choice Award, presented by the Residential Learning Communities on the UMass Amherst campus.

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Ashish Kulkarni joins faculty — September 2017

Ashish Kulkarni is one of the “Talented 12,” an international team of rising all-stars in chemistry, chosen by Chemical & Engineering News. Kulkarni is nicknamed the “Cancer Crusher” by the magazine.

He comes to UMass Amherst after serving as an instructor of medicine at Harvard Medical School and an associate bioengineer at Brigham and Women’s Hospital in Boston. Kulkarni’s research efforts have been focused on the development of pioneering structure-activity, relationship-inspired nanomedicine for cancer therapy.

“Disease develops in our body if there is an imbalance in the immune system,” Kulkarni says in his Chemical & Engineering News profile. “I’m developing dual-function nanoparticles that can allow us not only to create a balance in the immune system but also to monitor whether the drug is working in real time.

Kulkarni completed his undergraduate work at the Institute of Chemical Technology in India before earning his doctorate at the University of Cincinnati. He is the recipient of the Hearst Foundation Young Investigator Award, Dana-Farber/Harvard Cancer Center Development Award, American Association of Cancer Research Scholar-in-training Award, American Society of Pharmacology and Experimental Therapeutics Young Scientist Award, and the Melanoma Research Alliance Young Investigator Award.

Chemical & Engineering News is a weekly magazine published by the American Chemical Society. C&EN editors and reporters based in Europe, the U.S., and Asia cover science and technology, business and industry, government and policy, education, and employment aspects of the chemistry field.

and on YouTube (https://www.youtube.com/watch?v=zh8ifdtXo3g)

Peter Beltramo joins faculty — January 2018

Dr. Peter Beltramo comes to UMass from ETH Zurich, where he has been conducting postdoctoral research in the Soft Materials Laboratory. Prior to ETH, he earned his BS degree from the University of Pennsylvania before completing his PhD at the University of Delaware, both in Chemical and Biomolecular Engineering. His doctoral research focused on the electrokinetics and self-assembly of colloidal suspensions for photonic and phononic applications. Peter’s current research is in the area of interfacial soft matter. His work centers on developing new experimental methods and analysis techniques to study the biophysics of model cell membranes. It also includes investigating strategies to engineer foam and emulsion stability. Peter has published 16 peer-reviewed journal articles and is looking forward to continuing applying fundamental principles to understand and engineer interfacial processes central to biology and colloid science in his research group. In the classroom, Peter is eager to train the next generation of scientists and engineers and has previously been recognized as a Graduate Teaching Fellow, Research Ethics Fellow, and with the Robert L. Pigford Teaching Assistant Award.

https://beltramolab.com/

For more information about department research groups, visit che.umass.edu/research
Research Areas

Bioengineering: cellular engineering; metabolic engineering; targeted bacteriolytic cancer therapy; synthesis of small molecules; systems biology; biopolymers; nanostructured materials for clinical diagnostics, synthetic biology and cancer immunotherapy.

- Neil Forbes (Forbes Research Group)
- Ashish Kulkarni (Kulkarni Research Group)
- Jungwook Lee (Lee Research Group)
- Sarah Perry (Perry Research Group)
- Shelly Peyton (Peyton Research Group)
- Jessica Schiffman (Schiffman Research Group)
- Lauren Woodruff

Catalysis and Sustainable Energy: conversion of biomass to fuels and chemicals; catalytic fast pyrolysis of biomass; microkinetics; microwave reaction engineering; biorefining; high-throughput testing; reactor design and optimization; fuel cells; energy engineering.

- W. Curt Conner
- Wei Fan (Fan Research Group)
- Friederike Jentoft
- Rolf Jentoft

Materials Science and Nanotechnology: design and characterization of new catalytic materials; nanostructured materials for nanoelectronics, optoelectronics, and photovoltaics; graphene and carbon nanomaterials; synthesis and characterization of microporous and mesoporous materials; colloids and biomaterials; membranes; biopolymers; rheology and phase behavior of associative polymer solutions; polymeric materials processing.

- Peter Beltramo (Beltramo Research Group)
- Christos Dimitrakopoulos
- John Klier
- Dimitrios Maroudas
- T.J. Mountziaris (Mountziaris Research Group) - At NSF 2017/2018
- Sarah Perry (Perry Research Group)
- Jessica Schiffman (Schiffman Research Group)
- H. Henning Winter

Molecular and Multi-scale Modeling & Simulation: computational quantum chemistry and kinetics; molecular modeling of nanostructured materials; molecular-level behavior of fluids confined in porous materials; molecular-to-reactor scale modeling of transport and reaction processes in materials synthesis; atomistic-to-continuum scale modeling of thin films and nanostructures; systems-level analysis using stochastic atomic-scale simulators; modeling and control of biochemical reactors; nonlinear process control theory.

- Michael Henson (Henson Research Group)
- Peter Monson (Monson Research Group)
- Dimitrios Maroudas

Fluid Mechanics and Transport Phenomena: biofluid dynamics and blood flow; hydrodynamics of microencapsulation; mechanics of cells, capsules, and suspensions; modeling of microscale flows; hydrodynamic stability and pattern formation; interfacial flows; gas-particle flows.

- Jeffrey Davis
- Constantine Pozrikidis

Vital Statistics ChE

- 20 faculty members
- 16 Adjunct Faculty and 9 Staff members
- A Diverse Student Population (highest female % in the college)
- Undergraduate Program: ~432 BS students
  2017 Graduates: 101
  Co-Op positions: 9
  AICHE members: 80
  ISPE members: 30
  Chem-E Car: 13
- Graduate Program: ~60 PhD students
- External research funding: ~$4,000,000 per year
- Ranked in the top 30% of ChE Departments by NRC
- Ranked #33 by US News & World Report
- Ranked #2 in New England after MIT

Vital Statistics Engineering

- 128 faculty members
- Students in 2016-17 2,108 Undergraduates
  296 Master’s Candidates
  276 Doctoral Candidates
- Degrees Awarded in 2016-17
  456 Undergraduates
  136 Master’s
  44 Doctoral
- U.S. News & World Report ENGINEERING SCHOOL RANKING
  Undergraduate [September 2016]: #63 overall; #35 among public universities
  Graduate Programs (March 2017): #56 overall; #29 among public universities
Jeffrey Davis recently received two prominent campus awards: the UMass Distinguished Teaching Award and the Chancellor’s Leadership Fellow Award. The UMass Distinguished Teaching Award is the highest honor on campus for classroom excellence, and only four awards are given across campus each year.

Beyond his two most recent honors, Davis has a long history of accomplishments. He received the UMass Award for Outstanding Accomplishments in Research and Creative Activities in 2010, the Outstanding Junior Faculty Award from the College of Engineering in 2008, the Camille Dreyfus Teacher-Scholar Award in 2007, a National Science Foundation CAREER Award in 2007, the Outstanding Teacher Award from the College of Engineering in 2007, a Lilly Teaching Fellowship in 2007, a 3M Nontenured Faculty Award in 2006, a George Van Ness Lothrop Honorary Fellowship (2002) and a Gordon Y. S. Wu Fellowship in Engineering (1999) from Princeton University, the Roger de Friez Hunne-

man Prize in Chemical Engineering from the Massachu-
setts Institute of Technology (MIT) in 1999, and a num-
ber of other awards.

Davis’ research is in the area of physical applied mathe-
matics, with applications primarily in fluid mechanics and transport phenomena. Davis utilizes analytical and numerical methods to provide physical insight and an enhanced fundamental understanding of the underlying phenomena. He has made significant contributions in the dynamics of thin liquid films on heterogeneous surfaces, interfacial flows, hydrodynamic stability, and microscale flows involving the dynamic interaction of microparticles with nano-textured surfaces. Much of his current research is focused on blood flow through capillary networks and related subjects in biofluid dynamics.


Jessica Schiffman was recently awarded tenure with promotion to Associate Professor. Therefore, it was no surprise that Dr. Schiffman was also the 2017 award recipient of the Barbara H. and Joseph I. Goldstein Outstanding Junior Faculty Award. For this award, Dr. Schiffman was cited by the College of Engineering selection committee for her outstanding record in research, teaching, and service; including the development of novel bioinspired materials from natural polymers and her creative fundamental research at the interface of materials science and microbiology.

"Professor Schiffman has developed a highly visible research program in the field of nano-
fibers, functional coatings, and surfaces with an emphasis on the interface with biological systems," said Professor Klier. "Her research focuses on building nanofiber surfaces that control the collection and inactivation of bacteria and provide durable antimicrobial properties, along with novel coatings and materials that control and resist bacterial adhesion, attachment, and proliferation."

Schiffman earned her B.S. at Rutgers University in Ceramic and Materials Engineering, her M.S. at Cornell University in Materials Science and Engineering, and her Ph.D. at Drexel University in Materials Science and Engineering.
Sarah Perry Named 2017 Outstanding Teacher in the College of Engineering

Sarah Perry, along with Mechanical and Industrial Engineering faculty member David Schmidt, was chosen for the College of Engineering’s Outstanding Teacher Award. Perry was recognized for her approach and success in teaching first-year students and for her development of a novel course in microfluidics.

As one student wrote, “I absolutely loved the professor’s passion, professionalism, expertise, kind personality, her caringness, her ability to connect with the students, the way she went about preparing her material, and the way she taught (making it understandable and easy).” The student added that Perry made it clear how much she genuinely wanted to help the students.

Perry came to UMass Amherst after earning B.S. degrees in both Chemical Engineering and Chemistry and a M.S. in Chemical Engineering at the University of Arizona and her Ph.D. in Chemical Engineering at the University of Illinois at Urbana-Champaign.

Peter Monson Retiring

Joining the Department in the fall of 1982, Peter Monson was made Distinguished Professor in 2010. He has invested himself continuously in the department and its students — most recently acting as Undergraduate Program Director in 2015-2016. He will retire at the end of the 2017-2018 academic year and become Distinguished Professor Emeritus.

Shelly Peyton Named 2018 Outstanding Teacher in the College of Engineering

On March 30, 2018, Mechanical and Industrial Engineering Professor Matt Lackner and Chemical Engineering Professor Shelly Peyton were named recipients of the 2017-2018 College of Engineering Outstanding Teacher Award. They will be recognized during the College’s Senior Recognition Celebration to be held on Saturday, May 12, 2018.

Peter Monson (above, standing) and Michael Henson (above, seated) were elected Fellows of the American Institute of Chemical Engineers.

On November 29, 2017, Curt Conner gave the Annual Billig-Croft Lecture at Johns Hopkins “Sorption Insight into the Application of Nanoporous Networks.”
FACULTY PARTNER WITH MASSACHUSETTS COMPANIES TO FIND SAFER ALTERNATIVES

With a goal of reducing toxics use while keeping Massachusetts businesses competitive, several researchers are exploring safer alternatives, thanks to grants from the Toxics Use Reduction Institute (TURI) at UMass Lowell.

Camco Manufacturing in Leominster, is leading the charge when it comes to finding a safer alternative for methanol, used in the windshield washing fluid that it manufactures. The company is partnering with UMass Amherst researchers to conduct research on various alternative materials and methods.

“This partnership with Camco represents an opportunity to help improve the sustainability and environmental footprint of the industry,” says Asst. Prof. Sarah Perry of chemical engineering at UMass Amherst.

It’s not an easy problem to solve. Any replacement formula must have a freezing point below -20 degrees Fahrenheit, use inexpensive materials, maintain cleaning performance, remain stable during storage and be compatible with automobile surfaces.

“Finding a safer alternative will be more complicated than simply changing out one material for another,” says Perry. “Industries have already worked to optimize the performance while minimizing the environmental impact of their current formulations. We anticipate that more novel approaches like micro-emulsions have the potential to address hazard concerns while enhancing performance. However, we have a significant amount of work to do.”

Multi-institutional Research Team Invents New Sustainable Process to Make Key Ingredient in Synthetic Rubber and Plastics

Professor Wei Fan is part of a team of researchers from UMass Amherst, the University of Delaware (UD), and the University of Minnesota that has invented a process to make butadiene, a key ingredient in synthetic rubber and plastics, from renewable sources such as trees, grasses, and corn. Fan’s ChE graduate student Hong Je Cho is also part of the team. The findings are online and will be published in the American Chemical Society’s ACS Sustainable Chemistry and Engineering.

“There through the collaboration with Professor Michael Tsapatsis at University of Minnesota, we discovered that phosphorus-based catalysts supported by silica and zeolites exhibit high selectivity for manufacturing chemicals like butadiene,” says Fan about the catalytic process engineered for the new process. The team calls this new selective reaction "dehydration-decyclization" to represent its capability for simultaneously removing water and opening ring compounds at once.

Fan adds that “When comparing [the silica- and zeolite-supported catalysts’] capability for controlling certain industrial chemistry uses with that of other catalysts, the phosphorous materials appear truly unique and nicely complement the set of catalysts we have been developing at CCEI.”

The Fan Porous Materials Research Group at UMass Amherst focuses on the rational synthesis of nanoporous materials for the catalysts of biorefinery and drug delivery carriers. The engineering for the catalysts’ pore structure and size, surface properties, and active sites is based on the comprehensive understanding of their crystallization mechanism.

Butadiene is the chief chemical component in a broad range of materials found throughout society. For instance, when this four-carbon molecule undergoes a chemical reaction to form long chains called polymers, styrene-butadiene rubber is formed, which is used to make abrasive-resistant automobile tires. When blended to make nitrile butadiene rubber, butadiene becomes the key component in hoses, seals, and the rubber gloves ubiquitous in medical settings. In the world of plastics, butadiene is the chief chemical component in acrylonitrile-butadiene-styrene (ABS), a hard plastic that can be molded into rigid shapes. Tough ABS plastic is used to make video game consoles, automotive parts, sporting goods, medical devices, and interlocking plastic toy bricks, among other products.

“[This new technology significantly expands the slate of molecules we can make from lignocellulose],” says Professor Paul Dauenhauer, formerly of the UMass Amherst ChE department and now at the University of Minnesota. Dauenhauer is co-director of CCEI and a co-author of the study.

Multi-institutional Research Team Invents New Sustainable Process to Make Key Ingredient in Synthetic Rubber and Plastics
Michael Henson receives grant from NIH for Continuing Study of the Human “Body Clock”

Professor Michael Henson is the principal investigator for a three-university collaborative project, which involves creating mathematical models of “circadian rhythm” generation to better understand sleep disorders and other diseases triggered by the malfunction of this 24-hour “body clock” in humans. The research is being supported by a very significant, four-year, $1,809,385 grant from the National Institutes of Health (NIH).

Henson’s NIH research project is entitled “Multiscale Modeling of the Mammalian Circadian Clock: The Role of GABA Signaling,” and the co-PIs are Erik Herzog of Washington University and Yannis Kevrekidis of Princeton University.

Henson’s models simulate how some 20,000 neurons in the suprachiasmatic nucleus (SCN) region of the hypothalamus, located in the brain stem, synchronize with each other to create the circadian rhythm that helps control sleep patterns in humans and other mammals.

A circadian rhythm is a 24-hour cycle in biochemical, physiological, or behavioral processes controlled by the SCN. Although such body clocks are built-in and self-sustaining in humans, they are influenced by external cues, the primary one being daylight.

Henson’s role in the project is to take data about the neurons, generated through biology experiments by his collaborators, and build models that accurately simulate how the 20,000 neurons of the SCN act as a synchronized system to produce the circadian clock. The process requires Henson’s team to analyze the experimental data, create individual neuron models with them, then incorporate these individual models in complex system models of how all the neurons work together.

Henson’s collaborator at Washington University is circadian biologist Herzog, whose main hypothesis is that VIP, which is secreted by neuron cells, works to set up communication among the neurons in the SCN.

The research has the potential to be highly transformative by both advancing the multiscale modeling of coupled oscillators/complex networks and by fundamentally changing the human understanding of GABA signaling in circadian timekeeping and potentially in other brain regions.

Michael Henson named Executive Director of CACHE (Computer Aids for Chemical Engineering)
Dimitri Maroudas is the UMass Amherst Principal Investigator (PI) on a new 5-year $19,600,000 SciDAC (Scientific Discovery through Advanced Computing) center on "Plasma-Surface Interactions: Predicting the Performance and Impact of Dynamic PFC Surfaces" awarded by the U.S. Department of Energy (DOE). This is a multi-institutional (six national laboratories, four research universities, and one company) research center funded by DOE’s Offices of Fusion Energy Sciences and Advanced Scientific Computing Research and led by Prof. Brian D. Wirth of the University of Tennessee Knoxville and Oak Ridge National Laboratory. The new SciDAC centers were announced by DOE in the fall of 2017. This new center on plasma-surface interactions will build on the success of the team’s previous 5-year $11,499,000 SciDAC center, where Prof. Maroudas also served as UMass PI, leading the team’s surface physics research activities. SciDAC centers address grand-challenge ("big science, big computing") problems, and advance the state of the art in computational science utilizing leadership-scale computing facilities.

The objective of this center is to develop, and integrate, high-performance simulation tools capable of predicting plasma facing component (PFC) operating lifetime and the impact of the evolving surface morphology and composition of tungsten-based PFCs on plasma contamination, including the dynamic recycling of fuel species and tritium retention, in future magnetic fusion devices. This project will enable discovery of phenomena controlling critical PFC performance issues, and quantitatively predict their impact on both steady-state and transient plasma conditions. The outcome of this project will be a suite of coupled plasma and materials science models and a leadership class PFC simulator to predict PFC evolution and feedback to the boundary plasma. Success in the proposed research tasks will enable the prediction of both plasma fueling and the sources of impurity contamination that impact core plasma performance, and will lay the foundation for understanding, designing and developing the materials required to meet the performance objectives of future fusion reactors. The image above is a schematic of the International Thermonuclear Experimental Reactor (ITER). Nuclear fusion is a widely recognized grand challenge for science and engineering in the 21st century.

Research in Prof. Maroudas’ group at UMass, within this center, will focus on developing models and simulation tools to predict PFC surface morphological evolution and near-surface structural evolution and to evaluate how such dynamical response affects thermomechanical PFC materials properties, including thermal conductivity, elastic properties, and mechanical strength. The research will involve a comprehensive suite of first-principles and classical computational statistical mechanical simulators, as well as rigorous hierarchical (atomistically informed), multiscale models of surface and atomic transport and plasma-exposed materials kinetics.

Dimitri Maroudas is the UMass PI in multi-million, multi-institutional SciDAC Center on Plasma-Surface Interactions

DIMITRI MAROUDAS GIVES KEYNOTE LECTURE ON COMPUTATIONAL MATERIALS SCIENCE

Dimitri Maroudas was one of two keynote lecturers at the Second International Computational Science and Engineering Conference that took place in Doha, Qatar in October 2017. Prof. Maroudas’ keynote lecture was entitled “Defect Engineering and Patterning of Crystal Surfaces, Epitaxial Thin Films, and Two-Dimensional Materials: A Computational Materials Science Approach”. The presentation emphasized how computational materials science can help revolutionize materials processing and function, focusing on the exploitation of pattern forming instabilities on surfaces of crystals and epitaxial thin films to enable new nanofabrication technologies and on defect engineering of graphene derivatives and graphene-based carbon metamaterials.
Lin Du recognized for seminal work on Nanoscale Surface Roughness Reduction

The American Institute of Physics (AIP) posted a press release for an article [Applied Physics Letters 110, 103103 (2017)] by Lin Du and Dimitri Maroudas entitled “Current-Induced Surface Roughness Reduction in Conducting Thin Films”. This work demonstrated how atomic transport on the surface of a nanoscale-thin metallic film, driven by an externally applied electric field, can be used to eliminate nanoscale surface roughness, which is a major materials reliability problem in modern electronic technologies. “In a significant advance,” AIP summarized the significance of the research, particularly within the microelectronics realm, engineers have established electrical surface treatment of conducting thin films as a physical processing method to reduce surface roughness.” According to the press release, surface roughness reduction is “a really big deal when it comes to fundamental surface physics and while fabricating electronic and optical devices.” The paper was highlighted on the Applied Physics Letters homepage, and news articles for this work also appeared in most physics and science news websites. Lin Du, a Ph.D. student in Prof. Maroudas’ group, defended his Ph.D. dissertation in November of 2017 and is now a member of the Senior Engineering Design Enablement team at Globalfoundries. Click for the AIP press release

Paper by Dwaipayan Dasgupta and Ashish Kumar makes the cover page of Surface Science

An article co-authored by Dwaipayan Dasgupta, Ashish Kumar, and Dimitri Maroudas was selected for the cover page image of the journal Surface Science (volume 669, March 2018), the leading surface physics and chemistry journal published by Elsevier. The paper is entitled “Analysis of Current-Driven Oscillatory Dynamics of Single-Layer Homoepitaxial Islands on Crystalline Conducting Substrates” and reports important findings on the complex driven nonlinear dynamics of epitaxial islands on conducting substrate surfaces and its implications for physical processing methods of surface nanopatterning. The article was also announced on Elsevier’s Physics Twitter channel. Ashish is a Ph.D. student in Prof. Maroudas’ group; Dwaipayan is a recent Ph.D. graduate of the group and alumnus of the Department (Ph.D., 2016), and he is currently a postdoctoral research associate at the University of Tennessee Knoxville and Oak Ridge National Laboratory.
Peyton Group—Soft Materials, Cancer Biology, and Cell Motility

“We are several women and men, engineers and biologists, and our mission is to learn how cells process information from their chemical and physical tissue environment. We design polymeric biomaterials to create models of human tissue, and use them to study how cells move, grow, and respond to drugs in different tissue environments. We use this approach to find new ways to stop cancer metastasis, discover more effective cancer drugs, prevent heart disease, and build scaffolds for regenerative medicine.” (Peyton website)

Biomaterials and Systems Biology

We collaborated with Aaron Meyer at UCLA to combine biomaterials-based drug screening and systems biology to find new, highly effective drug combinations to treat breast cancer. Alyssa Schwartz and colleagues led this effort and it was recently published in Integrative Biology. You can also find this work on biorxiv.

New dynamic gels

Yen Tran recently led an effort, with collaborators John Klier and Todd Emrick at UMass, to create new gel networks that stiffen under strain. These gels rely on “cryptic” reactive groups, which are only strain-responsive when externally activated. This work was recently published in Soft Matter and can be found on ArXiv.
The Schiffman lab synthesizes bioinspired materials for a range of biomedical, environmental, and industrial applications. We focus on engineering natural polymers and plant-derived agents because they offer us a "greener" platform of desirable intrinsic properties. A few of the materials that we are currently developing include: wound healing nanofiber scaffolds, biomedical hydrogels, drug delivery nanoparticles, antifouling thin film coatings, and high-flux fouling-resistant membranes. Establishing structure-to-function relationships, as well as the investigating the materials-microbe interface are of particular interest to us. Our research is interdisciplinary in nature, drawing influences from chemical engineering, materials science, and microbiology. 

(Schiffman website)
20

Research continued...

Perry Research Group

Research in the Perry laboratory utilizes self-assembly, molecular design, and microfluidic technologies to generate biomimetic microenvironments to study and enable the implementation of biomolecules to address real-world challenges. Individually, microfluidics represents an enabling technology for high throughput analyses such as the time-resolved structural analysis of enzyme dynamics, while control over molecular interactions in self-assembling polyelectrolyte systems can be used to examine the interplay between biomolecules and the environment. Together, these capabilities can be coupled to generate artificial organelles for use in applications ranging from biochemistry to bioenergetics, biocatalysis, and biomedicine. Furthermore, this work has tremendous pedagogical potential to inspire students to work at the intersection of chemistry, biology, and engineering. (Perry website)

Sarah Perry has transformed her class in microfluidics from the sort of dry theoretical course she took in graduate school into the kind of applied, do-it-yourself experience that every engineer loves. Perry designed her course in “Microfluidics and Microscale Analysis in Materials and Biology CHEM-ENG 590E” to give students industrially and scientifically relevant, hands-on, laboratory projects based on microfluidic technology.

Perry says that this hands-on approach is like the difference between reading a recipe and actually being able to make a soufflé. As she explains, “A lot of microfluidics courses really focus on textbook learning or reading scientific articles. And there’s this real difficulty incorporating that learning with real-life experience in the classroom. The critical factor about microfluidics is that it’s easy enough to do. And so we’ve set up a variety of projects that are sponsored by labs on campus or different organizations off-campus.”

One of those sponsored off-campus projects comes from the UMass Medical School, one is from the Merck, and one even originated from a national lab in Australia, all incorporated into Perry’s course through her own very extensive networking.

“And it really gives students the opportunity to build these devices in the lab and also to work on the same kinds of open-ended problems that they will experience in industry,” Perry observes. “And so they go in there and, if it doesn’t work, or it clogs, or it spreads food coloring everywhere, then they have to work it out. That sort of open-ended problem is different from what we normally teach in the classroom, and so I think it’s really useful.”
Lee Research Group

Our current research focuses on bioengineering and therapeutic targeting of the bone marrow microenvironment that implicate clinical importance as a major reservoir of adult stem cells that are in constant production of mature blood cells, a key regulator of body homeostasis via continuous crosstalk with distant organs, and in instances of cancerous lesion, a potent instigator of metastatic spread. With core expertise in biomaterials, microfabrication, cellular engineering, and biomedical imaging, we study underlying roles of bone marrow extracellular matrices and stromal cells in forming and sustaining highly regenerative microenvironments as well as their transformation in pathological and aging processes. The science and technology under the study are expected to contribute to broad areas of research including regenerative medicine, cell transplantation, stem cell niche targeting therapeutics, tumor metastasis, immunotherapy and aging. Our research will gradually expand to create other lymphoid tissue analogues (e.g. lymph nodes, thymus, spleen) while pursuing extensive collaboration to drive adoption of these models by basic, clinical and industrial researchers in stem cell and cancer biology. (Lee website)

Bone Marrow in Health and Disease
HSC: Hematopoietic Stem Cells
BMDC: Bone Marrow Derived Cells
CTC: Circulating Tumor Cells
Outstanding Alumni Award Recipients—2017

SENIOR ALUMNI AWARD

Karin Rotem, PhD, is senior vice president for Beverages Regional Research and Development teams in the global beverage category of PepsiCo. She is responsible for the beverage research and development (R&D) centers in North America, Latin America, China/Asia Pacific, Middle East Africa/India, and Europe. Rotem’s team objective is to meet the needs of the local consumer by bringing to life the business annual operating plan while working with R&D partners to secure a robust and healthy portfolio for the future. Rotem has been with PepsiCo for 16 years. While her background expertise is technical, she has a range of experience from product innovation and commercial development to innovation strategy, portfolio management, and venture capital investment.

Prior to her current role, Rotem was vice president for research and development for the global snacks R&D category. In that role, she had responsibility for delivering reframe and breakthrough innovation for the Global Core Salty Frito Business. She was also responsible for building global capability in process optimization and efficiency, and global culinary capability.

Before joining Frito-Lay, Rotem was part of the management team leading global beverages group portfolio innovation strategy in the corporate arm of R&D. Rotem has also served as chief of staff to PepsiCo’s chief scientific officer.

Rotem served as PepsiCo’s first venture director at Physic Ventures, LLC. She scouted investments in the food and nutrition sector and was exposed to the venture ecosystem of entrepreneurs, academia, and institutional investors.

Prior to venturing, Rotem was based in China where she created PepsiCo’s first beverage R&D center in Shanghai. There she built a state-of-the-art R&D lab, a strong and sustainable R&D team of Peoples Republic of China nationals, and was responsible for launching locally relevant and differentiated beverages for the Chinese market. With her leadership, Pepsi China launched Ready to Drink Soy, Tropicana Juice Drinks with botanicals, and kick-started a Traditional Chinese Medicine Functional Water category.

Prior to China, Rotem championed the new product commercialization process for Asia. She also spent time in the Water Technology and Quality Group focused on purification, surface chemistry, and packaging materials.

Before her tenure with PepsiCo, Rotem worked at Nestle, Merck, and IBM. She earned her PhD in the field of Ab Initio Computational Chemistry from the Department of Chemical Engineering at the University of Massachusetts Amherst and her BS in chemical engineering from Lehigh University.

Rotem considers herself a global citizen. Her passion is experiencing global cuisine and understanding the connection to local culture. She grew up playing tennis and soccer, enjoys hiking through urban jungles (aka big cities), and now more than ever dabbles with lifestyle technology that can enhance healthy living. Rotem is a STEM ambassador and advocate hoping to introduce science and technology to the up and coming generation. Along those lines, Rotem and her husband Jeroen spend most of their free time “tinkering” alongside their two-year old twins, Jade and Justin.

JUNIOR ALUMNI AWARD

Dawn Eriksen-Stapleton, PhD, is a senior scientist at Pfizer in Andover, Massachusetts. She achieved a BS in chemical engineering and biochemistry at UMass Amherst in 2007. During her time at UMass, she was an active participant in undergraduate research at the university and was involved in summer research programs at MIT and Caltech.

Eriksen-Stapleton pursued a doctoral degree in chemical engineering at the University of Illinois Urbana-Champaign, graduating in 2014. Her research focused on developing novel and impactful techniques for protein and pathway engineering in yeast. Her work contributed to major biofuels research endeavors at the Energy Biosciences Institute.

After a post-doc at a small biotechnology startup in Medford, Mass., she began her career at Pfizer in cell culture process development where she leads portfolio projects and research initiatives. Currently, she is pursuing management courses at Tufts University. Her accomplishments include multiple first-authored and co-authored research publications, a patent, several notable research presentation awards, and prestigious fellowships including a Goldwater Scholarship and an NSF graduate research fellowship.

To see the latest Chemical Engineering News, check out che.umass.edu/news/
Christine Seymour Elected as President of American Institute of Chemical Engineering (AIChE)

Christine Seymour ’95

UMass Chemical Engineering alumnna Christine Seymour, the director in Global Regulatory Chemistry and Manufacturing Controls at Pfizer Inc, has been chosen as the president elect of the American Institute of Chemical Engineers (AIChE) and will take office in 2018. Dr. Seymour will also serve on the AIChE Board of Directors in 2017.

Dr. Seymour is an AIChE Fellow and received the 2012 Program Committee’s Herb Epstein Award for Technical Programming from AIChE.

At Pfizer, she leads the regulatory strategy and implementation for a portfolio of projects across all phases of drug development, commercial applications, and established products. Previously, she led chemical process research teams at Pharmacia and G.D. Searle.

She has worked at Pfizer since 2004. Dr. Seymour has also served as secretary on the AIChE Board of Directors from 2013 to 2015 and as a member of the Board of Directors of the Society for Biological Engineering from 2009 to 2011. She was a research advisor in chemical process development at Searle/Pharmacia from 1995 to 2004.

Dr. Seymour has chemical engineering degrees from Lehigh University (B.S.) and UMass Amherst (Ph.D.), as well as a Regulatory Affairs M.S. from Temple University. She currently serves on the UMass Amherst College of Engineering’s Department of Chemical Engineering Advisory Board.

According to AIChE, Dr. Seymour has enjoyed participating in AIChE leadership for more than 20 years, including: chair of the Forum Formation Committee and first chair of the Pharmaceutical Discovery, Development, and Manufacturing Forum; director of the Society for Biological Engineering; chair of the Executive Board of the Program Committee; Board of Directors; Spring Meeting program chair; and chair of the Process Development Division.

AIChE is a professional society of more than 53,000 chemical engineers in 110 countries. Its members work in corporations, universities, and governments using their knowledge of chemical processes to develop safe and useful products for the benefit of society. Through its varied programs, AIChE continues to be a focal point for information exchange on the frontier of chemical engineering research in such areas as nanotechnology, sustainability, hydrogen fuels, biological and environmental engineering, and chemical plant safety and security.

This year’s AIChE Meetings:
October 28—November 2, 2018 in Pittsburgh, PA

AIChE ® 35 Under 35

Christoph Krumm
Cofounder and CEO
Sironix Renewables,
Paul Dauenhauer
Student

“Accomplishing a dream can stop you in your tracks, which is where Krumm found himself when he learned his startup, Sironix Renewables, had received its first bit of funding. Years of coursework and research had led him to this standstill, but only for a moment. He hopes to grow the small company, which develops new environmentally friendly and safe chemicals from plants for industrial and consumer products.

He first became interested in chemical and energy alternatives while participating in a race car engineering program as an undergraduate. Designing the fuel system in the car sparked his interest in alternative fuels, and during graduate school, he focused on catalytic reaction engineering for renewable fuel and chemical technologies.

Running a startup has given Krumm the freedom to define his own problems and come up with his own solutions. He explains, “Seeing all of the smaller tasks and projects come together into a company vision is hugely inspiring.”

Graduate Degrees Awarded—2017

Feb 2017:

Hong Je Cho, PhD (Wei Fan)
Nanoporous Solid Acid Materials for Biomass Conversion into Value-Added Chemicals: Synthesis, Catalysis, and Chemistry

Mohammad Navaid Khan, PhD (Peter Monson)
Study of the Self-Assembly Process of Microporous Materials Using Molecular Modeling

May 2017:

Jin Chen, PhD (Michael Henson)
Metabolic Modeling and Engineering of Gas fermentation in Bubble Column Reactors

Aaron Chen, PhD (Maria Santore)
Interactions at the Aqueous Interface of Large-Area Graphene: Colloidal-Scale and Protein Adsorption

Shengkai Li, PhD (James Watkins)
Fabrication of Functional Nano-Materials and Devices Using Supercritical Fluids

Hongbo Shi, PhD (Ashwin Ramasubramaniam/Scott Auerbach)
Computational Study of Structure-Function Relationships of Supported and Unsupported Metal Nanoclusters

Sept 2017:

Lauren Jansen, PhD (Shelly Peyton)
Tissue-guided engineering of polyethylene glycol hydrogels

Ashutosh Rathi PhD (David Ford/Peter Monson)
Modeling of Nanoscale Transport in Mesoporous Membranes

College of Engineering Outstanding Alumni Award:

2016/17

SENIOR AWARDS
Roberto Padovani ’83MS, ’85PhD (ECE)
Edward S. Price ’90 (Che)
Martin C. Ross ’86 (MIE)
John P. Sullivan, Jr. ’72 (CEE)

JUNIOR AWARDS
Vered Bisker-Leib ’02MBA, ’03 PhD (ChE)
Aaron M. Dollar ’00 (MIE)
Tiffany T. Labrie ’03, ’05 MS (CEE)
Justin S. Peavey ’93 (ECE)

2017/18

SENIOR AWARDS
Jon W. Dietrich ’69, ’74 MS (CEE)
Ellen J. Ferraro ’89, ’94 PhD (ECE)
Spyros Michail ’88 MS, ’91 MS (MIE)
Karin Rotem ’99 PhD (Che)

JUNIOR AWARDS
Marnie A. Bonner ’09 (MIE)
Dawn T. Eriksen-Stapleton ’07 (ChE)
Yong Liu ’02 PhD (ECE)
Heather A. Rothenberg ’03 MS, ’09 PhD (CEE)
In Memoriam

James Douglas
1933-2017

Emeritus Professor James Douglas, 83, passed away at his home on February 15, 2017. In attendance was his beloved wife of 59 years, Betsy Douglas. Douglas was a full professor at UMass Amherst for nearly 30 years, was elected to the National Academy of Engineering, and was a recipient of the UMass Amherst Chancellor’s Medal. So great was his influence that a former student established the Professor James Douglas Early Career Faculty Development Award in the College of Engineering in his honor.

Douglas cut a distinctive path through the process design community in chemical engineering. He pioneered a rational approach to design, embodied in a systematic design method that altered the well-established belief that no one could teach process design without years of experience. Douglas joined the UMass Amherst ChE department in 1968, served as department head from 1979 to 1982, and retired in 1997.

Obituary

Robert Laurence
1936-2018

Dr. Laurence was a professor of Chemical Engineering at the University of Massachusetts for 33 years, serving as department head from 1981 to 1989. An eclectic researcher and dedicated teacher, with over 75 publications to his name, he lectured and spent time as a visiting professor and researcher in France, England, India, China, Japan, Argentina, Germany and Belgium. Bilingual, his French language skills stood him in good stead as he became a consultant for French firm Rhone-Poulenc, and later received a Docteur ès Sciences (honoris causa) from the Institut Nationale Polytechnique de Toulouse. After retirement from UMass, he went on to work as a Station Director for M.I.T.’s David H. Koch School of Chemical Engineering Practice, directing programs in England, Singapore and Germany. His goal in teaching was to produce students who were better than he was. He claimed that this was accomplished. Many of his former students occupy faculty positions at U.S. and international universities.

Dr. Laurence is survived by his wife of 58 years, Carol, his sister Dr. Louise Laurence and her husband Douglas Hamilton, of Baltimore, Md., his brother Paul Laurence and his wife Jeanine of Fort Myers, Fla.; his sons, Jonathan of Springfield, Mass., Andrew of Waynesboro, Va., his daughter Lisa and her husband Dr. Brett Krasner of Charlottesville, Va.; grandsons Alexander, Nathaniel, James and Benjamin Krasner.

Obituary
Department Faculty

Timothy Anderson
Dean, Engineering

Christos Dimitrakopoulos
Professor
Materials Science

Friederike Jentoft
Professor
Catalysis, Surface Chemistry

Peter Beltramo
Assistant Professor
Soft Matter

Wei Fan
Associate Professor
Porous Materials Synthesis
Chief Undergraduate Advisor

Rolf Jentoft
Lecturer
Catalysts, Senior Lab

W. Curt Conner
Professor
Catalysis, Biofuels

Neil Forbes
Professor
Biochem. Metabolic Engin.

John Klier
Professor & Department Head
Novel Materials

Jeffrey Davis
Professor
Fluid Mechanics

Michael Henson
Professor
Biological Systems Modeling

Ashish Kulkarni
Assistant Professor
Drug Delivery, Bio-inspired materials
Department Faculty

Jungwoo Lee  
Assistant Professor  
Translational Biomaterials

T.J. Mountziaris  
Professor (at NSF 2017-18)  
Electronic and Photonic Materials

Jessica Schiffman  
Associate Professor  
Bioinspired soft materials, Antifouling/Antibacterial Materials

Michael Malone  
Distinguished Professor and-Vice Chancellor for Research and Engagement

Sarah Perry  
Assistant Professor  
Biomimetic Materials, Protein Dynamics

H. Henning Winter  
Distinguished University Professor  
Polymer Rheology

Dimitrios Maroudas  
Professor  
Computational Materials Sci.

Shelly Peyton  
Associate Professor  
Cell Motility and Bioengineering, Stem Cell Therapies

Lauren Woodruff  
Assistant Professor  
Synthetic Biology and Metabolic Engineering of Bacteria

Peter Monson  
Distinguished Professor  
Statistical Mechanics, Materials Modeling

Constantine Pozrikidis  
Professor  
Fluid Dynamics, Computational Materials Science
The Chemical Engineering Department offers a highly-rated undergraduate program accredited by the Accreditation Commission of ABET (www.abet.org) offering a Bachelor of Science in Chemical Engineering (B.S.Ch.E.) and a vibrant graduate research program that balances chemical engineering fundamentals and industrial technology. From its foundation in the 1950s, the Department has educated distinguished scholars and technical leaders.

Today, our faculty continues to be recognized for its technological innovation and contributions to engineering science fundamentals in the fields of fluid mechanics and transport phenomena, scientific computing, bioengineering, materials science, nanotechnology, and sustainable energy. The Department is committed to academic excellence in an environment that appreciates individual efforts and fosters interdisciplinary collaborations.

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