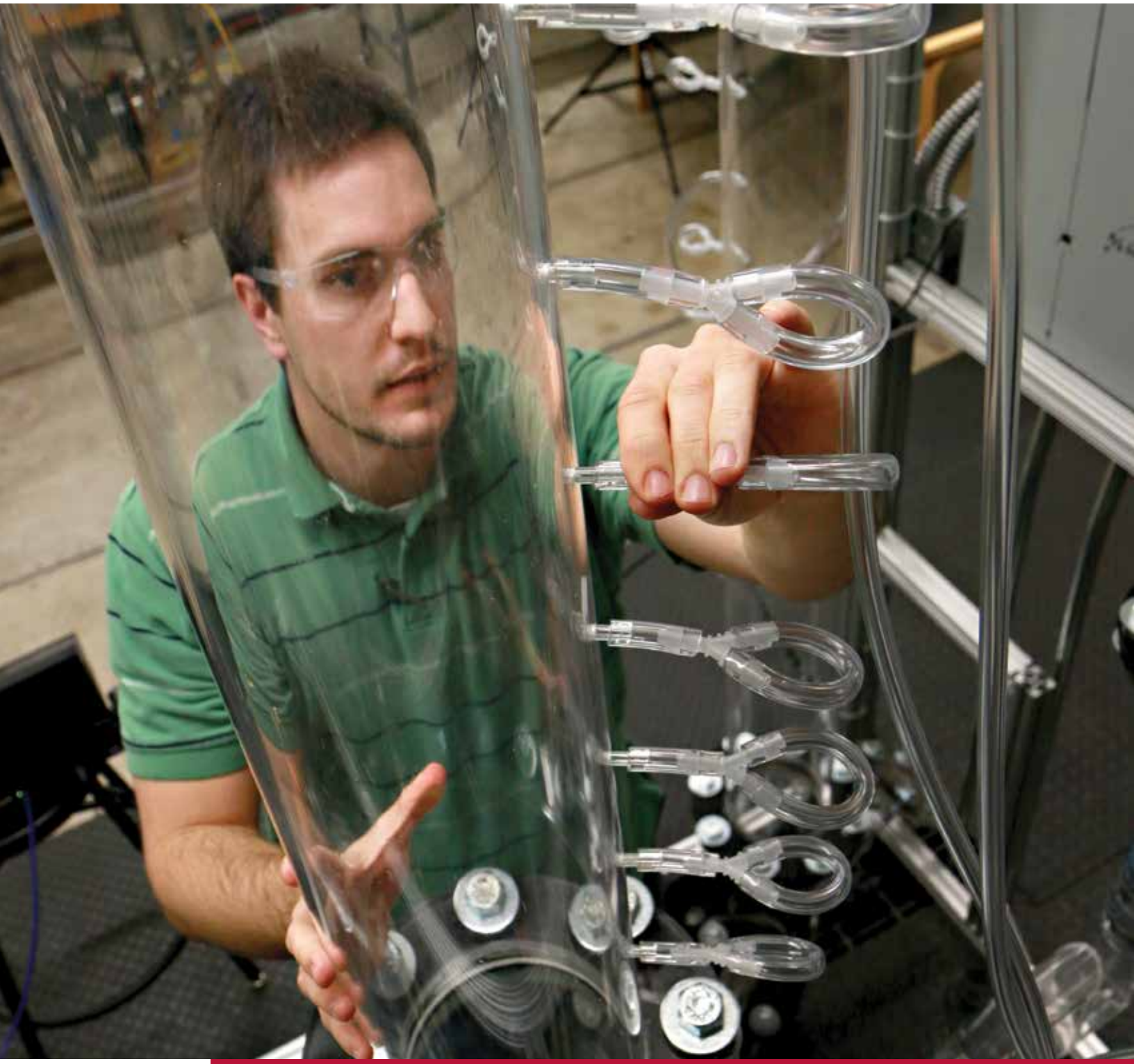
THE MIXING CUP

FOR THE UNIVERSITY OF UTAH ALUMNI & FRIENDS



THE UNIVERSITY OF UTAH

DEPARTMENT OF CHEMICAL ENGINEERING

FALL 2015

WELCOME FROM THE CHAIR

Dear Friends:

The University of Utah's Department of Chemical Engineering is experiencing phenomenal growth. We graduated our largest ever Bachelor of Science class this year. We also conferred 11 Master's and seven Ph.D. degrees. The master's degrees include our first batch of five from Petroleum Engineering. The growth in our undergraduate program is both exciting and challenging.

I am delighted to report that we added Dr. Swomitra Mohanty (Bobby) and Dr. Kerry Kelly to our faculty. Bobby brings his expertise in nanotechnology, devices and sensors with applications in medicine, water purification and process diagnostics, while Kerry has vast knowledge in air-quality monitoring, health effects and sustainability. Our faculty are conducting groundbreaking research in the areas of energy, environmental, biomedical and advanced materials, and we will be adding more faculty members in the future.

Our research expenditures held steady at around $8 million in this highly competitive research funding environment. Our faculty continues to publish impactful research in areas ranging from biomedical to energy, and they were successful in obtaining a number of research grants. Professor Mikhail Skliar's group published an article on characterization of exosomes, which are 30-150 nm vesicles released into the blood by many cell types, including cancer cells. Their identification may lead to early and better cancer treatment and better understanding of the immune response.

I would also like to highlight two recent research awards in the area of carbon dioxide capture: "Characterizing Impacts of High Temperatures and Pressures in Oxy-Coal Combustion Systems," led by Professors Jost Wendt and Andrew Fry, and "Integrated Oxygen Production and CO2 Separation Through Chemical Looping Combustion Process with Oxygen Uncoupling," headed by Professors Kevin Whitty and JoAnn Lighty.

We cherish the support of our alumni and friends. We honored Guin Cummings and Dr. John Williams at the Annual Distinguished Alumni Dinner in 2015. We held our first ever Graduate Student Symposium in March 2015. This event provided a forum for our soon-to-be graduating Ph.D. students for presenting and discussing their work as well as interacting with students, faculty, alumni and industry representatives.

We have a growing and dynamic undergraduate program. Last year, our team won the National Chem-E-Car competition at the AIChE Annual Meeting in Atlanta.

We invite you to visit the department and see firsthand the exciting changes in all aspects of the department.

Milind D. Deo
Department Chair, Chemical Engineering

ALUMNI RECOGNIZED FOR CAREER ACHIEVEMENTS

The department began a tradition in 2007 of recognizing our alumni for professional achievements, contributions to society and support to the department and university. This year's Distinguished Alumni Dinner was held on March 5, 2015 at the University Guest House to honor Ms. Guinevere A. Cummings and Dr. John A. Williams. Guinevere Cummings (Class of 1982) began her professional career with IBM, developing innovative technologies with applications in new computing products. Career opportunities took her to Hercules Aerospace / ATK Launch Systems where she worked for 26 years. Her contributions centered in areas of process development and project engineering for new technologies and materials in support of propulsion for the U.S. defense and space programs. In 2010, Guin joined Flextronics, a global electronics manufacturing company, where she worked to implement quality control measures throughout an international, electronics supply chain.

In addition to a busy professional and personal life, Guin has supported the university and department by mentoring young women and men to pursue science and engineering studies. She has been active in support of our career fairs and senior laboratory renovation, and has served on the Chemical Engineering Industrial Advisory Committee. We are pleased to have honored and thanked her for her on-going participation and support of chemical engineering education at the University of Utah. In her acceptance speech she took the opportunity to recognize the "highly reputable" yet "small and intimate school" that produced the quality education that she received at Utah. She expressed appreciation for faculty, family and alumni friends, especially her lab mates Dr. JoAnn Slama Lighty and Michael McCurdy.

Dr. John Williams began his educational career at the University of Delaware (B.S. Chemistry) then completed an M.B.A. degree in Finance at the University of Chicago. He came to Utah in 1981, where he earned a master's and Ph.D. in Chemical and Fuels Engineering under the supervision of Dr. Frank Hanson. After developing those skills in science, engineering and business, John founded and serves as general manager of EPS Engineering and Design, a full-service engineering firm providing engineering, development and valuation services for energy and biotechnology companies. Among the vast number of industries serviced, EPS has contributed to developments in power generation, oil refining, combustion, liquefaction, gasification and bioprocessing technologies. It also provides services in the conversion of petroleum, coal natural gas, biomass, municipal and industrial wastes, grains, and biofuels.

Williams has been a featured author and instructor for the American Institute of Chemical Engineers and American Society of Mechanical Engineers. He expressed appreciation to the faculty from the 1980s, noting that members including David Pershing, Frank Hansen, Lamont Tyler, Noel deNevers, Bob Seader, Dave Bodily, Wendell Wiser and Alex Oblad, focused on "understanding the fundamentals" and the "impact engineering should have on society." He continues to push for the same educational experiences today; namely, how to be an engineering professional and understanding fundamental concepts.

"I am proud of the university, very honored to be part of the university," he said.

DOING GLOBAL GOOD

Every summer, Swomitra Mohanty would visit his family in India and sometimes see the horrific disease and dismal living conditions that plagued many residents there.

While his family resided in a comfortable home, just across the street lived a woman and her children in a hut, he said, underscoring the stark contrast between the rich and poor in his family's native country.

"It was just walls and straw," he said of their neighbor's home. "I thought, 'This is absurd. How can I be right here while this person is 30 feet away from me and is barely surviving on what she begs for or picks up and sells?' And their conditions were not very sanitary."

The economic plight of his family's country, as well as other developing nations around the world, is what helped shape Mohanty's passion to become an engineer.

"If I'm going to be an engineer and a professor, then I should be doing something every single day to make the place better in some small way," said Mohanty, an assistant professor of chemical engineering at the University of Utah.

Mohanty may have found that in a microscopic material no bigger than one-thousandth the width of a human hair — a titanium dioxide nanotube that could be a key to helping stave off thirst and tuberculosis in developing countries.

Mohanty has been spending his first four years at the university developing uses for this unique form of nanotube, which was initially developed by Manoranjan Misra, a U professor of metallurgical engineering and chemical engineering. From it, he and his colleagues are on the verge of creating two devices: a breathalyzer that can identify carriers of tuberculosis and a water purifier that can destroy the bacteria in unclean water via the sun's rays. Both devices currently have prototypes and are going through extensive testing with positive results, he said.

During a 2008 visit to Orissa, India, Mohanty learned from a doctor that tuberculosis, an often-fatal infectious disease that attacks the lungs, was rampant in the country's rural areas. "In India, tuberculosis has been a huge problem for a long time," Mohanty said. "One of the reasons is they can't find it quickly enough."

In order to accurately detect tuberculosis in a patient, doctors typically test blood or sputum at a clinic. But Mohanty's lab is developing a portable breathalyzer that can determine if the person may have the disease and needs further testing, and it will at least confirm if the person does not have the bacteria.

The patient blows into a bag, and the breath passes through a sensor made up of the titanium dioxide nanotubes. Based on the results, the sensor will alter the electrical current recorded on a potentiostat, a box that reads electrochemical changes. Mohanty hopes to deploy about a hundred prototypes of his breathalyzer in Mumbai as early as this fall for more tests.

Meanwhile, Mohanty, along with research associate Krista Carlson, also have been developing a water purifier the size of a smartphone that kills bacteria with the same nanotubes by just shining light on a built-in solar panel.

Dirty water is poured into one end of the device and passes through a coil of the titanium dioxide nanotubes. That process creates radicals, a chemical species which kills the bacteria in the water. Additionally, the device also adds a small amount of voltage to create more radicals that clean the water even more.

"I can take one liter of water and treat it in three minutes, and that's not even optimized," Mohanty said. "And this is at concentrations of bacteria well above what you would find in nature."

Mohanty decided to focus his research on a new water purifier also while on a trip to India. He learned that scientists there are trying to create new low-cost water-purification technologies.

He now has a prototype and will begin field tests locally. He said he also could begin selling the device in stores for hikers in about a year and a half.

"It's a dream come true to see your research actually influence someone's life," he said. "Not very many people get to do that."

PUBLICATION HIGHLIGHTS

Our faculty continue to publish research significant in their areas. Professor JoAnn Lighty's work on implications of combustion aerosols on human health co-authored with Dr. John Veranth and with late Dr. Adel Sarofim surpassed 775 citations. The high-impact research of Professors Mikhail Skliar and Bobby Mohanty was discussed earlier. The work of Dr. Stuart Simmons on gold and silver resources in the Taupo volcanic geothermal systems in New Zealand was featured in the world press. Dr. Jules Magda, working with Dr. Prashant Tathireddy of Applied Biosensors, published a comprehensive article on using innovative biosensors for pharmaceutical applications. Dr. James Sutherland and his group published on more efficient and effective computer models to simulate complex turbulent combustion models including oxy-fuel combustion. For a complete list of faculty publications, please visit *http://www.che.utah.edu/research/publications/*.

BY THE NUMBERS: DEGREES AWARDED AND EXPENDITURES

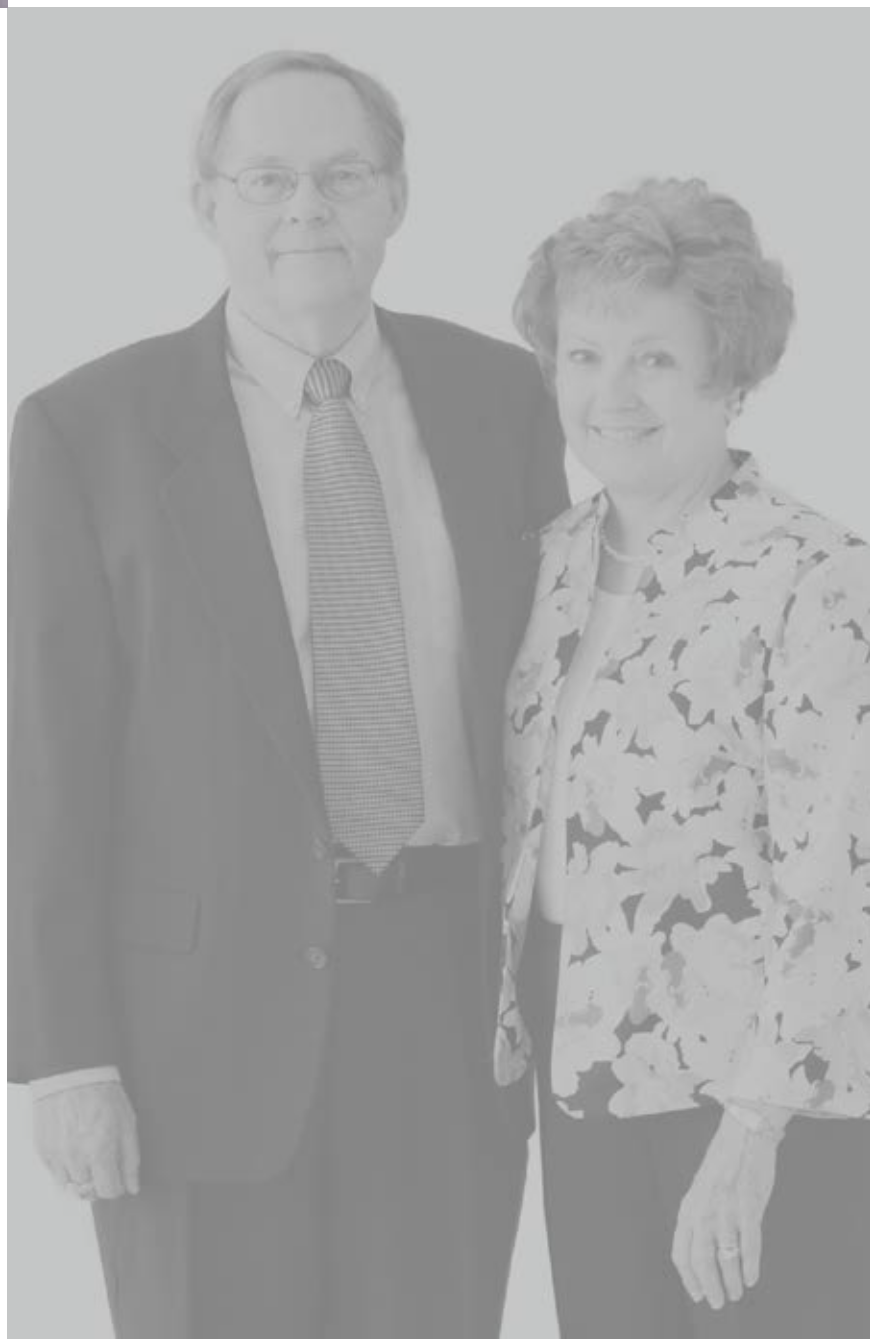
ACADEMIC YEAR	2012-13	2013-14	2014-15
BACHELOR'S OF SCIENCE	54	57	64
MASTER'S	4	6	8
Ph.D	12	7	7
RESEARCH EXPENDITURES (Millions of Dollars)	11.6 million	8.9 million	8.3 million

PETER D. AND CATHERINE R. MELDRUM ENDOWED PROFESSORSHIP

Peter D. and Catherine R. Meldrum — Meldrum is the co-founder and retired president and chief executive of Myriad Genetics, which launched the BRAC Analysis test, the world's first molecular diagnostic test to measure hereditary breast and ovarian cancer. He received his bachelor's degree in chemical engineering and an MBA at the University of Utah and is a founding member of the Engineering National Advisory Council, which he served on from 2002 to 2006. In 2002, he was named as one of the "Scientific American 50" by Scientific American magazine for his contributions to science and technology.

University of Utah Chemical Engineering Chairman Milind Deo was awarded an endowed professorship during a ceremony May 1 at the James L. Sorenson Molecular Biotechnology Building. The event was hosted by College of Engineering Dean Richard Brown and attended by U President David Pershing and Senior Vice President of Academic Affairs Ruth Watkins. Deo was appointed to the Peter D. and Catherine R. Meldrum Endowed Professorship in Chemical Engineering.

Deo received his undergraduate degree from the Indian Institute of Technology in Chennai (formerly Madras) and a Ph.D. in chemical engineering from the University of Houston in 1987. He joined the U's Department of Fuels Engineering in 1989, which merged with the Chemical Engineering Department in 1992. Deo became chair of the department in 2013. His research addresses oil and gas-enhanced oil recovery, reservoir engineering, and carbon dioxide sequestration, and he established the U's Petroleum Research Center. He served as the associate dean for academic affairs for the U's College of Engineering from 2006 to 2013. "It's a great honor," Deo said of his endowed professorship. "It's a validation of things that I have done at the university, and it's more motivation to continue to contribute to the science and technology of chemical engineering."



UNIVERSITY OF UTAH BEACONS OF EXCELLENCE AWARD

It was by accident that University of Utah chemical engineering assistant professor (lecturing) Anthony Butterfield discovered his love of teaching.

Five years ago, the then business consultant and engineering graduate had to fill in for another professor for a semester. Butterfield never intended to teach at a university.
"I had a crippling fear of public speaking. I never thought I could do this," he remembered. "They asked me to teach the senior lab, and it went really well. I just found a love for it. I found there was no better job than this."

Thanks to that unusual happenstance, Butterfield is now a popular faculty member who has gained the instant respect of students and colleagues alike. It was announced in May that Butterfield is one of six recipients of this year's University Of Utah Beacons Of Excellence Award, an annual recognition given to people, programs or departments that create a "transformational experience that empowers U. of U. students." He is the only engineering faculty member to receive the award this year.

"It was very touching," Butterfield said about the news. "I've known students I've worked with since they were my high school interns, and there's so many supportive colleagues."
Finding new and innovative ways to teach students has been a priority in his career. Butterfield developed a new freshman design lab so students can get hands-on experience building devices early on. He also is the adviser for the university's Chem-E-Car team (which won last year's national competition in Atlanta) as well as for the U's chapter of the American Institute of Chemical Engineers, and he has worked on the department's K-12 outreach team.

"It's hard to imagine anything more rewarding than students coming back and telling you that something you taught them helped them get a job," he said about the rewards of teaching.

NEW FACULTY

SWOMITRA (BOBBY) MOHANTY

Assistant Professor Swomitra (Bobby) Mohanty received his bachelor's in biology at the University of Chicago, his master's in electrical and computer engineering at Georgia Institute of Technology, and a doctorate in biomedical engineering at the University of Wisconsin.

Currently, his list of projects at the U include the development of a handheld tuberculosis breathalyzer device, nanomaterials for catalytic conversion of biofuels from renewable sources, and 3D printing technology for the development of fluidic models of petroleum reservoirs.

KERRY E. KELLY

Assistant Professor Kerry E. Kelly first earned her bachelor's in chemical engineering from Purdue University and a master's in environmental engineering from the University of North Carolina at Chapel Hill. She received her doctorate in environmental engineering at the University of Utah earlier this year.

Kelly is focusing on air quality research and is associate director of the U's Department of Program for Air Quality, Health, and Society. She also serves on the Utah State Air Quality Board, the Air & Waste Management Association, and the Utah DEQ Carbon Capture Advisory Committee.

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DISTINGUISHED LECTURE SERIES

Tuesday, October 27, 2015
Linda M. Abriola, Tufts University

"Nanoparticle Transport in Subsurface Formations: Novel Characterization Tools and Emerging Pollutants"
**Co-sponsored/hosted by Civil and Environmental Engineering Department*

February 23, 2016
David B. Graves, UC Berkeley

"Cold Atmospheric Plasma Biomedicine"

March 29, 2016
Adel F. Sarofim Distinguished Lecture
Joseph J. Helble, Dartmouth College

April 12, 2016
Michael T. Klein, University of Delaware

"Software Tools for Molecular-Level Kinetic Modeling in Thermochemical Conversions"