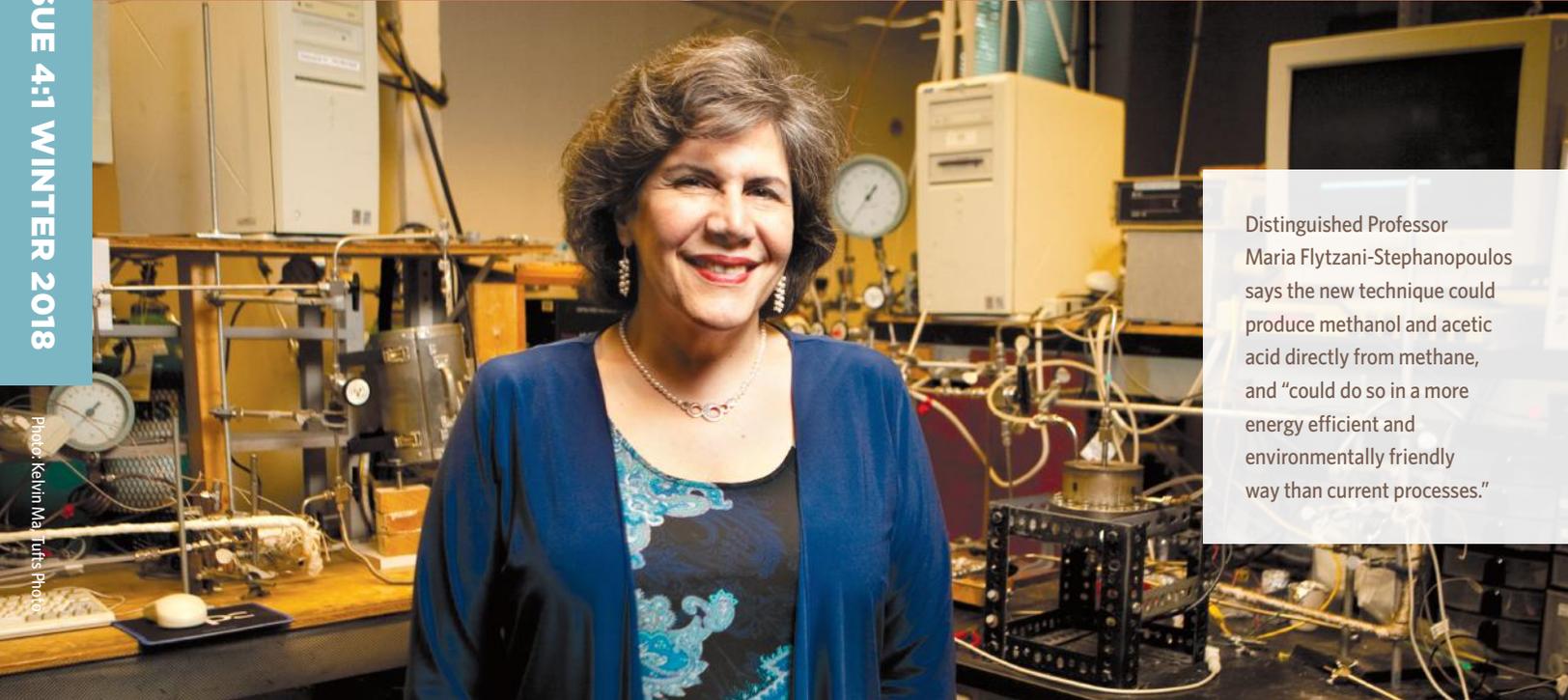


# DEPARTMENT OF CHEMICAL + BIOLOGICAL ENGINEERING



Distinguished Professor Maria Flytzani-Stephanopoulos says the new technique could produce methanol and acetic acid directly from methane, and “could do so in a more energy efficient and environmentally friendly way than current processes.”

Photo: Kelvin Ma / Tufts Photo

## BREAKTHROUGH FOR METHANE CONVERSION

Researchers developed a process that could lead to more energy efficient production of methanol or acetic acid.

Researchers developed a breakthrough method to oxidate methane into methanol at low temperatures using a heterogeneous catalyst and cheap molecular oxygen, according to a paper published in *Nature* by a team led by Tufts University chemical engineers. The current method for producing methanol from methane- or coal-derived synthesis gas involves a multi-step process that is neither efficient nor economical in small-scale applications. As a result, scientists have been seeking more efficient and less expensive ways to convert methane with a process that uses inexpensive molecular oxygen in mild conditions in which relatively low temperatures and pressures are used.

The Tufts-led researchers found that they could use molecular oxygen and carbon monoxide for the direct conversion of

*Continued on page 3*

**The growth of hydraulic fracturing and the subsequent use of shale gas have dramatically accelerated the desire to upgrade methane into more valuable chemicals.**

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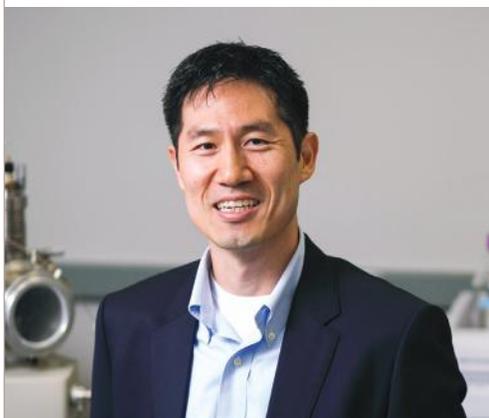
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# FROM THE CHAIR



Dear Friends and Colleagues,

It has been another highly successful year for the department. We have graduated a stellar class of students, bid fond farewells, welcomed new faces, and celebrated the many wonderful accomplishments of our students, faculty, and staff.

Last year, Beth Frasso took a position with the university's Advancement Division. As Department Administrator for over six years, Beth was invaluable in building our close-knit community. I am delighted to let you know that Margaret DeChiaro, who has served

the department exceptionally alongside Beth, has been promoted to the position of Department Manager. Over the summer, we welcomed a new staff member, Maura Tierney, who is ably filling the role formerly held by Margaret.

In the fall, the department further upgraded its facilities by relocating some of its research laboratories to the newly constructed Science and Engineering Complex (SEC). This state-of-the-art building is now home to two ChBE faculty laboratories: the Nair group and my own group. We are thrilled to collaborate with neighboring laboratories from different departments on exciting projects ranging from microbiome engineering to studying the gut-brain axis.

This newsletter highlights prestigious peer recognitions of scholarly achievements, groundbreaking research conducted by faculty and students, and awards that recognize and support the department's activities in research, teaching, and service. I am delighted to share the news that Distinguished Professor Flytzani-Stephanopoulos' transformative work on methane

conversion was recently published in *Nature* and *Nature Chemistry*.

The department's productivity continues to rise. Over the past year, faculty members have secured new grants and contracts totaling more than \$2.5 million, obtaining support from a wide variety of federal and non-federal sources.

On a somber note, I am saddened to share with you the sudden passing of Associate Professor Jerry H. Meldon. Over more than three decades, Professor Meldon has been a mentor and friend to students, staff, and faculty members in the department. We miss him dearly.

Thanks to the efforts of talented and dedicated faculty members, students, and staff, as well as generous support from our alumni and friends, the department continues to thrive as a vibrant community of learning and scholarship.

With warm regards,  
Kyongbum Lee  
Professor and Chair

## Notables...

Ph.D. candidates **Ilin Sadeghi** and **Anthony D'Angelo** each received a Tufts Institute for the Environment (TIE) Research Fellowship.

Associate Professor **Matthew Panzer** received funding from the Massachusetts Clean Energy Center to develop a flexible, lightweight technology for lithium-ion batteries. He was also selected as the ChBE graduating class's Favorite Professor of 2017.

Three students—**Greg Berumen**, E19, **Trang Ngo**, E19, and **Aaron Watts**, E18—were selected as Tufts Summer Scholars. They conducted research projects, working closely with faculty mentors, over the summer of 2017.

Three chemical engineering Ph.D. candidates—**Anthony D'Angelo**, **Huan Qin**, and **Elliot Taylor**—worked with Fletcher School students to deliver a successful pitch at the 2017 \$100k New Ventures Competition. Their pitch, which was awarded third place in the competition's General/High Tech track, utilized a laboratory-developed ion gel electrolyte to fabricate batteries that are safer, more flexible, and last longer on a single charge. They were also selected to join the 2017 cohort of MassChallenge finalists.

Working with researchers across Tufts, Assistant Professor **Prashant Deshlahra** received a Tufts Collaborates seed grant for a project titled "Improved Selective Hydrocarbon Dehydrogenation Catalysis Using Microporous Metal Oxides."

**Jacob Kronenberg**, E18, won the award for best poster presentation in the separations division at the AIChE Annual Meeting undergraduate poster fair. The poster title was "Amphiphilic Polymers for Membrane Separation and Ion Removal," based on his work in the lab of Assistant Professor **Ayse Asatekin** with Ph.D. student **Ilin Sadeghi**.

**Mengwei Li**, Ph.D. candidate in Professor **Maria Flytzani-Stephanopoulos'** group, received a competitive AIChE Catalysis and Reaction Engineering (CRE) Division Student Travel Award to present his research at the 2017 Annual AIChE meeting.

Assistant Professor **Prashant Deshlahra** and Associate Professor **Hyunmin Yi** were awarded a \$364,000 National Science Foundation grant to develop a new method of preparing membranes with thin hydrogel selective layers.

## Methane Conversion *Continued from page 1*

methane to methanol catalyzed by supported mononuclear rhodium dicarbonyl species, anchored on the internal pore walls of zeolites or on the surface of titanium dioxide supports that were suspended in water under mild pressure (20 to 30 bar) and temperature (110 to 150° C).

The same catalyst also produces acetic acid through a different reaction scheme that does not involve methanol as an intermediate. Carbon monoxide is essential to the catalytic reaction, which is heterogeneous. Tuning the reaction to either methanol or acetic acid is possible by properly controlling the operating conditions, especially the acidity of the support.

Even after many hours of reaction, there is no leaching of the catalyst in the water, the study found.

The paper's senior author, Maria Flytzani-Stephanopoulos, Ph.D., a Distinguished Professor and the Robert and Marcy Haber Endowed Professor in Energy Sustainability, said that while more study is needed, "we are encouraged that this process holds promise for further development."

Shan, J., Li, M., Allard, L.F., Lee, S., Flytzani-Stephanopoulos, M. "Mild oxidation of methane to methanol or acetic acid on supported isolated rhodium catalysts." *Nature*. Published online and print Nov. 30, 2017. DOI: 10.1038/nature24640. ■

## RESEARCH HIGHLIGHTS

### Selective Transport through Membranes

In a paper published in *ACS Nano*, Tufts researchers demonstrated that it's possible to make highly selective membranes that separate organic compounds not only by size but also by charge, using a simple, scalable process.

Written by Ph.D. candidate Ilin Sadeghi, Jacob Kronenberg, E18, and Assistant Professor Ayse Asatekin, the paper was recognized as an ACS Editors' Choice. Corresponding author Asatekin says, "If we can design very selective membranes that can perform high volume, high energy chemical separations, we can really decrease the energy use and carbon emissions associated with manufacturing."

Read more at: <http://go.tufts.edu/membranes>

Sadeghi, I., et al. "Selective Transport through Membranes with Charged Nanochannels Formed by Scalable Self-Assembly of Random Copolymer Micelles." *ACS Nano*. Article ASAP, doi: 10.1021/acsnano.7b07596. ■

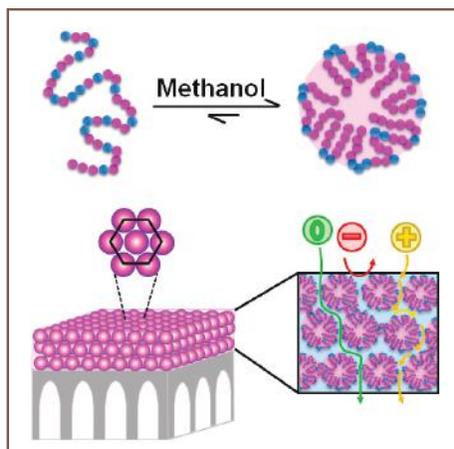
### Optogenetic Regulation of Insulin Secretion

Ph.D. candidate Fan Zhang and Associate Professor Emmanuel Tzanakakis hypothesized that a photoactivatable adenyl cyclase (PAC) can be employed to modulate cyclic AMP in  $\beta$ -cells with light, thereby enhancing insulin secretion. They reported in *Nature Scientific Reports* that a cAMP increase was noted after the PAC gene from *Beggiatoa* (bPAC) was delivered to  $\beta$ -cells.

Furthermore, greater insulin release was also observed over repeated cycles of photoinduction without adverse effects on viability and proliferation. The optogenetic system, with modulation of cAMP and insulin release, can be employed for the study of  $\beta$ -cell function and for enabling new therapeutic modalities for diabetes.

Read more at: <https://www.nature.com/articles/s41598-017-09937-0>

Zhang, F. and E. Tzanakakis. "Optogenetic Regulation of Insulin Secretin in Pancreatic  $\beta$ -cells." *Sci. Rep.* 7, 9357, doi: 10.1038/s41598-017-09937-0. ■



## OFF CAMPUS



In April, Assistant Professor **Ayse Asatekin** delivered a seminar at Worcester Polytechnic Institute, an invited talk at the Materials Research Society (MRS) spring session in Phoenix, Arizona, and a seminar at Arizona State University.



Distinguished Professor **Maria Flytzani-Stephanopoulos** was named an Honorary Professor by the Beijing University of Chemical Technology, and delivered a plenary lecture at the International Green Chemical Engineering Summit in Beijing.



At the 2017 annual AIChE Annual Meeting in Minneapolis, Professor **Christos Georgakis** was honored with a special session for his seventieth birthday. Colleagues and former students reflected on Georgakis' contributions to the field.



Professor and Chair **Kyongbum Lee** gave invited presentations at the AIChE Annual Meeting and the 8th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM BCB), on the topic of metabolomics and the microbiome.

# DEPARTMENT NEWS

## Gregory D. Botsaris Fund



The department is continuing its efforts to endow the Gregory D. Botsaris Fund, in memory of our colleague and beloved teacher of many generations of Jumbos. Please consider a gift to show your pride in the Department of Chemical and Biological Engineering.

Throughout his career at Tufts from 1965 to 2004, Professor

Botsaris worked tirelessly to bring the Department of Chemical and Biological Engineering to prominence. The Gregory D. Botsaris Fund aims to honor his contributions to the department and ensure that his legacy continues. The purpose of the Fund is to strengthen the department, including continuing the biennial Botsaris Lecture, recognizing outstanding students, and supporting other programs of importance to the department. ■

**RAISED TO DATE: \$65,000**



To date, we have reached 65% of the \$100,000 target, through generous support from alumni, friends, and current faculty members of the department.

### How to Donate

To give to the Botsaris Fund, please designate your gift to "Gregory Botsaris Fund, account CRO08702."

#### By Check:

Payable to "Trustees of Tufts College" and sent to Tufts University, P.O. Box 3306, Boston, MA 02241-3306.

#### By Credit Card:

Call our toll-free number, 866-351-5184 (from anywhere in North America) or call 617-627-4705 to make a gift via credit card.

#### Online:

For secure online gifts by credit card, please go to [tuftsgiving.org](http://tuftsgiving.org), select Engineering, Other, then type in your designation (Chemical and Biological Engineering Dept.).

## ON CAMPUS



### Gregory Botsaris Distinguished Lecture

In April 2017, Bruce C. Gates, Distinguished Professor of Chemical Engineering at UC Davis, delivered the biennial Gregory Botsaris Distinguished Lecture. Gates' lecture illustrated some supported molecular catalysts with appealing properties. ■

### Graduate Research Symposium

Associate Professor Emmanuel S. Tzanakakis facilitated the first Graduate Research Symposium for ChBE in 2017. The symposium hosted speakers from local industry, and participants attended lunch and a poster presentation. ■

## AIChE 2017



Seated in the front row of the session honoring Professor Georgakis, from right to left: Ph.D. candidate Zhenyu Wang, Professor Georgakis, Tina Georgakis, and Foteini Makrydaki, EG10.

In October 2017, faculty, students, and alumni traveled to Minneapolis for the Annual Meeting of the American Institute of Chemical Engineers (AIChE) to share their research findings. At this year's meeting, a special session was held in honor of the seventieth birthday of Professor **Christos Georgakis**. Undergraduate and graduate students also participated in talks and presentations at the meeting.

# CONGRATULATIONS TO OUR GRADUATES

Congratulations to all those who graduated in 2017! The department held its annual brunch to recognize the Class of 2017 during commencement weekend, honoring students' hard work during their time at Tufts. Five students graduated with summa cum laude honors: Michael DeCortin, Jacob Isaacson, Sylvia Lustig, Elijah Martin, and Katherine McMurray. Three students successfully pursued and defended a senior honors thesis: Michael DeCortin, Luis Rebollar Tercero, and Jacob Santos-Marques.



At the 2017 School of Engineering Graduate Programs Ceremony, Assistant Professor Ayse Asatekin hooded Prity Bengani.

## Doctoral Recipients

### Prity Bengani

Thesis: Zwitterionic Copolymer Self-Assembly for Fouling Resistant, High Flux Membranes with Small Molecule Selectivity  
Advisor: Ayse Asatekin

### Andrew Fiordalis (February 2017)

Thesis: Development of Accurate and Computation-Efficient Linearization Techniques for Modeling Absorption with Complex Chemical Reaction  
Advisor: Jerry Meldon

### Mahboubeh Rahmati Rostami

Thesis: Investigation of Stem Cell Population Heterogeneity Using Single Cell Analysis and Computational Modeling  
Advisor: Emmanuel Tzanakakis

## Master of Science Recipients (Bioengineering)

### Carol Chan

Thesis: Identification of Metabolites that May Reinforce Colonization Resistance Against Infection in an Antibiotic Augmented Gut  
Advisor: Kyongbum Lee

### Haixing Kehoe (August 2017)

Thesis: Targeting the Tumor Microenvironment with Protein-Small Molecule Hybrids  
Advisor: James Van Deventer

### Lauren Tice

Thesis: Controlled Fabrication of Opal Structured Janus Hydrogel Microparticles via Sequential Micromolding  
Advisor: Hyunmin Yi

## Master of Science Recipients (Chemical Engineering)

### Nyasha Madziva

Thesis: Analysis of Acid Gas Absorption in a Mixed Amine System  
Advisor: Jerry Meldon

### Joshua Wimble

Thesis: Single Atom Alloy Catalysts for C-H Bond Activation and Propane Dehydrogenation  
Advisor: Maria Flytzani-Stephanopoulos

## Master of Engineering Recipients (Bioengineering)

### Michael Kreuze

**Ketaki Nade** (February 2017)

### John Ward

## Master of Engineering Recipient (Chemical Engineering)

### Rebecca Frank

## Bachelor of Science Recipients

### Brian Bertini

### Maurice Bukenya

### Nicholas Cicchetti

### Nicholas Dechiara

### Michael DeCortin

### Sika Gadzanku

### Andrade Hendricks

### Cassidy Hubert

### Jacob Isaacson

### Kirsten Jorgensen

### Ari Kazanjian

### Sylvia Lustig

### Elijah Martin

### Katherine McMurray

### Samuel Nave

### Elliot Nielson

### Parthkumar Patel

### Allison Pine

### Luis Rebollar Tercero

### Patricia Rosa

### Emil Rubakh

### Jacob Santos-Marques

### Timothy Savidge

### Brian Smith

### William Stockton

### Nicholas Turiano

### Wesley Viola

### Christopher Warren

### Chloe Wong

### Jonathan Yeh

## Departmental Award Winners

### Brian Bertini, E17

Constantine Ghikas Prize in Romance Languages

### Sopuruchukwu Ezenwa, E18

Gemma Cifarelli Memorial Scholarship

### Jacob Isaacson, E17

Department of Chemical and Biological Engineering Prize

### Kirsten Jorgensen, E17

Class of 1911 Prize Scholarship

### Christopher Keyes, E18

Class of 1898 Prize

### Sylvia Lustig, E17

Association of Tufts Alumnae 75th Anniversary Award

### Samuel Nave, E17

Ellen C. Myers Memorial Prize

### Trang Ngo, E19

Karno Dean's Award for Academic Excellence and Leadership

### Zhenyu Wang, Ph.D. Candidate

Tufts School of Engineering Award for Commitment to the Practice of Engineering

# ALUMNI UPDATES/NEWS

**Brett Boghigian**, E07 and EG10, and **Lawrence Weiner**, E98 and EG16, are Senior Directors at Indigo, an agricultural biotechnology company headquartered in Charlestown, Massachusetts that harnesses nature to help farmers sustainably feed the planet.

**Ahmet-Hamdi Cavusoglu**, E09, completed his Ph.D. in chemical engineering at Columbia University, focused on researching how the evaporation of water in nature could be harnessed as a source of renewable energy. He is now working as an Associate Director at the Academic Venture Exchange, and as the Director of Partnerships at the Innovation Accelerator Foundation.

**Christopher Ghadban**, E14 and EG17, received a Celdara Medical High-Potential Entrepreneur Fellowship, which enables participants to explore a wide range of executive skills. He now operates as a business development consultant within the life science and technology industries.

**Marielle Groundwater (Pleasant)**, E05 and EG06, was recently selected as the Head of the Engineering Department at Genentech, South San Francisco Production, where she has worked for 11 years.

**Fernando Lima**, EG07, now an assistant professor of chemical and biomedical engineering at West Virginia University, earned a prestigious CAREER Award from the National Science Foundation for his work to improve modular systems for energy applications.

**Kyle McElearney**, EG08, joined Amgen as a Senior Scientist in Bioprocess Sciences and Technologies. He previously worked at Biogen for 10 years, most recently as a Senior Engineer.

**Mary Money**, E80 and P17, now leads product development for Newman's Own in Westport, Connecticut.

**Dana Pung (Svendsen)**, E09, spent the past two years working in Italy improving production for a shop acquired by GE before returning to the U.S. to work at GE Aviation's Additive Technology Center in West Chester, Ohio.

**Andrew Rosen**, E15, was awarded a National Defense Science and Engineering Graduate (NDSEG) Fellowship.



In 2017, **Earl St. Sauver**, E13, was named to the Forbes 30 Under 30 Social Entrepreneurs list with his co-founder of Apollo Agriculture. Launched in 2016, their company uses remote sensing, machine learning, and mobile technology to expand modern farming techniques to small farms, currently mainly relying on family labor, in emerging markets. Apollo Agriculture seeks to help farmers increase their profits. Its first product was targeted to Kenyan maize farmers. ■



In the summer of 2017, members of the Class of 1976 gathered in Boston. From left to right: Chris McHugh Purington, John Gillis, John Lauring, Bob Panora, and Mike Travers.



In November 2017, Robert Schulten, E78, Emil Rubakh, E17, and Mary Money, E80, met at a Tufts alumni event at the Asylum Distillery in Bridgeport, Connecticut, which is owned by Schulten.



Tracy Van Tassel, E08, wed Matthew Smoker on October 29, 2016, in Old Tappan, New Jersey. A number of Jumbos were in attendance, including Tufts Engineering alumni Kevin Pearlstein, E08, Victoria Clark, E08, and Ion Tsinteris, E08.

# IN MEMORIAM

## Remembering Jerry Meldon, Associate Professor of Chemical and Biological Engineering



Jerry Meldon, associate professor of chemical engineering and a member of the Tufts faculty since 1978, passed away on July 18, 2017. Always an advocate for student success in research and industry, he received the Henry and Madeline Fischer Award for engineering teacher of the year in 2010. His exemplary service to the department and our students included serving as the chair of the department from 1994 to 2000.

At faculty meetings, Professor Meldon would often advocate for giving students a strong foundation in chemical engineering basics before they could branch off into newer disciplines. Some of those courses, such as thermodynamics or fluid dynamics and heat transfer, were among the most challenging undergraduate courses at the school. Professor and Chair Kyongbum Lee remembered his empathy, saying, "He used to go out of his way to give his students chances to do well."

Nyasha Madziva was a student in the math course Professor Meldon taught for chemical engineers. "He taught it in a super-intelligent way," Madziva said. "Some of it got over your head sometimes, but he was funny in his approach and very thorough. I got back confidence in my math ability." So much so that she asked Professor Meldon to be her advisor for her master's thesis, which she completed in May. In all, he advised 47 master's and doctoral students at Tufts.

Professor Meldon received his bachelor's degree in chemical engineering from Cooper Union and his doctorate from the Massachusetts Institute of Technology. He served on the advisory board of the Global Development and Environment Institute at Tufts.

As Jianmin Qu, dean of the School of Engineering, said, Professor Meldon was "a great asset to the university and had a profound impact on the students he taught throughout his 40-year career at Tufts. He will be greatly missed by many students, colleagues, alumni, and staff."

If you wish to leave a remembrance of Professor Meldon, please send an email to [chbe@tufts.edu](mailto:chbe@tufts.edu) and we will forward the collected responses to his family. He leaves his wife, Robin, and his children, James, Seth, and Perri, A13. ■



Left: Professor Meldon posed with newly-awarded Ph.D. Andrew Fiordalis at the 2017 School of Engineering Graduate Programs Ceremony.

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and Biological Engineering  
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REQUESTED



In 2017, Chemical and Biological Engineering majors Greg Berumen, Trang Ngo, and Aaron Watts each received Summer Scholars funding to carry out an independent research project. For his project, Berumen tested new strategies for discovering inhibitors capable of disrupting the proliferation of cancer cells, in Assistant Professor James Van Deventer's lab. To learn more about the project, visit: [go.tufts.edu/berumen](https://go.tufts.edu/berumen)