

KOFFOLT NEWS

FALL/WINTER 2019 | ISSUE 23

TRAILBLAZER UNIT OZKAN TAKES HELM

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THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Letter From The Chair



Dear Alumni and Friends,

As we head into a busy new year, I relish this moment to pause and reflect on the many wonderful things that continue to happen in the William G. Lowrie Department of Chemical and Biomolecular

Engineering. Our alumni, faculty and students ply their talents and skills in an amazing array of venues and applications. From exciting entrepreneurial efforts that make the world a safer, more resource-efficient place, to science-based medical innovations that save lives, our people do amazing things.

One of the most interesting projects I've seen this year is the work of **Jill Boughton** ('88). After a successful career at Procter & Gamble, she "threw away" a life of ease in retirement to advance unique models that assist developing regions economically while helping to solve their trash problems—a story of real courage and hope!

Four alumni were honored recently at the College of Engineering Awards ceremony: **William G. Lowrie** ('66) won the Lifetime Achievement Award for Leadership; **Laura Ensign** ('07) received the coveted Texnikoi Award; **Mike Triplett** ('97 BS, '04 PhD) won the Distinguished Alumni Award for Entrepreneurship and Innovation; and our own Advisory Board member, **Denise Burcham** ('87), received the Distinguished Alumni Award for Career Achievement. Another Advisory Board member, **Aisha Barry** ('95), was named to *Savoy Magazine's* 2019 list of Most Influential Women of Corporate America. In addition, **John Kuhn** ('07 PhD), one of my own former students, won a university-wide research award at the University of South Florida. I am sure that many other alumni received awards and honors, so please do let us know about your many achievements!

At the department level, I am especially pleased that our undergraduate program has received distinction in being ranked #21 nationally by the 2020 *U.S. News and World Report*, indicating strong upward improvement. And while the undergraduate program deserves great credit in and of itself, two of the most important considerations for its success are a strong faculty and an equally strong graduate program.

How is that, you might ask? The success many alumni enjoy today stems in part from having the support of faculty and graduate students. With today's larger classes, undergraduates benefit from the additional tutoring and face-time provided by highly capable, engaged graduate students who are working as TAs

(Unit Ops alone relies on 12 TAs each semester) or serving as research mentors for undergraduates who opt for research experiences.

Thus, I am thrilled that one of our most loyal alumni, **William G. Lowrie** ('66), creator of the H.C. "Slip" Slider Professorship in our department, has created a *second* endowed professorship to strengthen our program's foundation. I was very surprised and humbled to learn that the professorship was named in my honor!

The Umit S. Ozkan Professorship is now supporting **Li-Chiang Lin**, who is already gaining international recognition with his research. Dr. Lin is passionate about undergraduate education and together with his four doctoral students, he has four undergraduates working in his group. The professorship funds will be used to supplement summer scholarships for undergraduate research opportunities and to hire graduate students to help mentor undergrads.

One of my priorities as the department chair is to engage with our undergraduates outside the classroom so they feel that "they matter." As part of this effort, we began holding informal student gatherings such as *Coffee with a Prof*; *Coffee with an Alum*; and *Pizza with the Chair*. Students are able to share their concerns and hear about the life experiences of faculty or alumni. Fall topics ranged from "imposter syndrome" to "how to deal with change." The picture below was taken during a *Pizza with the Chair* event that I thoroughly enjoyed. The topic was "fear of failure."

These are but a few highlights of the many good things happening here. I hope you'll take a few moments to flip through these pages and find many more!

Take good care and keep in touch.

A handwritten signature in black ink that reads "Umit S. Ozkan".

Umit S. Ozkan
Engineering Distinguished Professor and Chair



UMIT OZKAN:

LEADING A NEW CHAPTER FOR OHIO STATE CBE

A fresh start always brings new ideas, and Professor Umit S. Ozkan has plenty of those!

Professor Ozkan was appointed as the eighth chair of the William G. Lowrie Department of Chemical and Biomolecular Engineering on June 1, 2019. This is the first time the department has had a woman at the helm in its 120+ year history.

Ozkan is excited and energized about the great potential she sees in the department. "With our outstanding faculty and dedicated staff, our strong research programs, and our undergraduate student body—which is among the best anywhere in the country—I am confident that we are poised to continue and accelerate the upward trajectory that our department has been following," she said

Having joined the faculty in CBE in 1985, Ozkan has seen many changes over the years. However, one thing has remained constant: the strong sense of harmony, collaboration and collegiality among the department's faculty. Ozkan intends to continue this tradition, creating an environment in which young faculty choose to build their careers and take pride in and ownership of the department's success. "My vision is for the department to be able to attract the most talented faculty and provide an environment where faculty can develop into outstanding teachers and world-renowned scholars," she said.

As a long-time faculty member, Ozkan has built relationships with hundreds of alumni—a critical asset to the department. "A department can only succeed when it has strong ties to alumni," she said. "I plan to reach out to better connect with and engage our alumni."

The undergraduate and graduate programs are also critical. She will endeavor to equip students with the skills to make them highly sought-after by industry and graduate programs, creating an environment in which students feel nurtured and cared for. "I want students to feel a sense of belonging so that they not only get the maximum benefit from their education, but also enjoy the many benefits that being an engaged alumna can bring."

KOFFOLTNEWS

contents





“TALKING TRASH”

with **Jill Boughton**, founder of **Waste2Worth**

"Technology implementation is only as good as the business model and circumstance it is leveraged in. There's nothing more dangerous than an engineer who understands finance."

-Jill Boughton

Trash. Many of us don't give it much thought. We simply throw it away or recycle it, and the items conveniently "disappear." *Or not.*

How to dispose of waste is a problem that has plagued humans for thousands of years. In 1800s England, trash was simply thrown into the street, and even the Vikings' "kitchen middens" (mounds of discarded seashells, bones and broken items) often got so large, they had to move to new dwellings.

Today, recycling seems like a solution, but it can be complex. China, the former largest importer of recyclable material, now limits its imports to cleaned and separated recyclables only. As cleaning/separating can be costly, alternate export markets were sought in Indonesia, India, Vietnam, Thailand and the Philippines. Meanwhile, given public pressure to stop sending "dirty" recyclables to these countries, America's largest trash management company has announced they will stop all exports. However, because of the lack of economically viable recycling infrastructure in the U.S. (largely due to labor costs), this good intention results in recyclable material ending up in landfills. Further, the recyclable dealers in the aforementioned countries end up going out of business because they

no longer have access to recyclable material. The net result is an overall reduction in recycling.

However, as waste management becomes increasingly troublesome and complex, **Jill Boughton** ('88) has found an answer—in developing countries at least: chemical engineering.

GENESIS OF AN IDEA

Boughton, who graduated from The Ohio State University in 1988 with a bachelor's degree in chemical engineering, began her career at Procter & Gamble, where she worked on products such as Metamucil, Pepto Bismol, and Pampers. Twenty-four years into her career, she was managing the creation of new overseas markets for baby and personal care products when her team realized that there was a burgeoning waste crisis looming in the developing regions where P&G's businesses were growing. Appropriate waste infrastructure did not exist, and while P&G wanted to expand into these regions, they wanted to do it responsibly.

Thus, Boughton's team started researching waste and quickly realized that the waste management models used in the U.S. would not work in developing areas. Something

more innovative was needed, and "Waste2Worth" was born.

"When I started Waste2Worth, I was just fascinated by the absolute complexity of the challenge," Boughton said. "I saw that the odd amalgamation of skills I had acquired over the years would help me tackle the problem. I felt I could really make an impact."

'Impact' is an apt term for describing Waste2Worth. The venture goes much further than just providing waste disposal systems. It can transform whole communities.

THE ACID TEST

The key to success is in individualizing the approach. Working project by project, Waste2Worth studies the local politics, economy and culture of different developing regions, analyzing a city's trash to tailor a solution specific to that community which extracts and leverages maximum value from the waste. Various types of waste are then converted into resources, building the community's infrastructure and leveraging the area's environmental, social and economic development. It's a revolutionary way of seeing waste: as potential worth.

As illustrated in the October 2019 issue of **National Geographic** (link:



Jill Boughton breaks ground on a new facility in Dagupan, Philippines, which is expected to bring 92 jobs to the area while solving regional pollution problems.

<https://go.osu.edu/w2w-natgeo>], Boughton set up a facility in Dagupan City, Philippines, where its 50-year-old, seven-acres-wide mountain of burning trash was polluting the ocean and endangering the local fishing economy.

Dow provided crucial funding to build a zero emissions waste-to-energy plant that will convert plastic trash into diesel fuel. The fuel will run the community's fishing fleet and public utility vehicles. Waste2Worth will also adapt 300 of the city's motorized tricycles to run on natural gas manufactured from Dagupan City's food waste, which had been releasing methane gas—26 times more harmful than carbon dioxide—into the air.

The plant will create 92 jobs and is providing a significant boost to the local economy while eliminating the toxic blanket of smoke over the city.

Waste2Worth Innovations has expanded to Indonesia, Africa, India, and Thailand, bringing better living conditions and increased resources to communities who learn how to turn hazardous, unsightly waste into their most valuable asset. Procter & Gamble, who gave Boughton permission to start the company using the intellectual property she developed as a P&G chemical engineer, continues to support W2W behind the scenes in

areas such as government relations.

So just how does chemical engineering fit into all of this? Boughton explains.

THE CHEM-E CONNECTION

"When I began at Procter & Gamble, I often wondered what chemical engineering had to do with my job responsibilities," she began.

"I soon found that chemical engineering provided me with an amazing array of skills that I did not even realize were being imparted to me at the time. I gained a certain way of thinking, sizing up a problem, solving the problem and a certain level of technical curiosity that translated quite well to my product development work at P&G, and which help me tremendously now," she said.

In fact, waste management and its technologies touch almost every concept learned in chemical engineering—mass/energy balances, heat transfer, mass transfer, kinetics, and thermodynamics, and also leverages knowledge of business modeling and market research.

Recognizing how these classic chemical engineering applications were being brought to bear on the problem and wanting to pass on

some of her hard-won knowledge, Boughton standardized her approach in a Capstone Project for Ohio State students, allowing them to work on a real-world problem. Students receive information such as a waste characterization study, ultimate and proximate analytical results, population data, waste generation rate, local industry, weather patterns, waste flows, and informal sector presence. They also learn what technologies and/or unit ops are available to them—thermal processes, bio processes, recycling technology, stream manipulation technologies, etc.—including rough capital costs and operating costs for each equipment type. They can also research on their own.

Their job is to design a holistic waste management system for that city that extracts the maximum value back from the trash to provide optimal environmental AND economic benefit, with detailed mass balances for their system along with output/off-take information leading to an economic analysis. "Design work is fun," says Boughton, "but in real life, the hard part is the implementation."

Boughton has never regretted her decision. "I realized I wanted to leave the world in a better place. This is what I was meant to do," she said.

Elite alumni recognized for achievement

In October, 2019, four chemical engineering alumni were recognized at the College of Engineering's *22nd Annual Excellence in Engineering and Architecture Alumni Awards* celebration featuring 22 exceptional alumni from across the College of Engineering who have achieved distinction in their fields.



William G. Lowrie ('66 BS) was the sole recipient of the **2019 Lifetime Achievement Award for Leadership**. Lowrie, now retired, was a successful oil and gas industry executive who played a major role in advancing energy production and drilling technology during his 33-career with Amoco. After joining the company in 1966, he worked his way up to become president of Amoco Oil Co. in 1990, president of Amoco Production Co. in 1992, and president and director of Amoco Corporation from 1995 until 1998, when the company merged with BP. He then served as deputy CEO of BP Amoco until retiring in 1999. A loyal alumnus, Lowrie's transformative gifts include supporting the construction of the Koffolt Laboratories and creating the H.C. "Slip" Slider and Umit S. Ozkan Professorships.



Laura M. Ensign ('07 BS) was one of two alumni honored with the **2019 Texnikoi Outstanding Alumni Award**. The Texnikoi Award is given to individuals under the age of 40 who have risen rapidly in the field of engineering, and are chosen by the College of Engineering's current undergraduate members of Texnikoi. Ensign has achieved a great deal in a short amount of time. She is the inaugural recipient of the Marcella E. Woll Professorship in Ophthalmology at Johns Hopkins University and vice chair for research for the John Hopkins Wilmer Eye Institute. She also created several approaches for improved drug administration that led to increased and sustained delivery to precisely targeted cells and tissues, which minimizes side effects and reduces the frequency of doses.



Biotechnology innovator **Michael Triplett** ('97 BS, '04 PhD) received a **2019 Distinguished Alumni Award for Entrepreneurship and Innovation**. Triplett is co-founder of Columbus-based 1787 Bio LLC, a gene and cell therapy company, and president of Carmen Partners, a life science commercialization and innovation consultancy. He currently leads the InnovateOhio Life Sciences Working Group for Ohio Lt. Governor Jon Husted, charged with proposing a life sciences economic development strategy for the state. He co-founded and served as president and CEO of Myonex Therapeutics, a clinical-stage gene therapy company developing first-ever treatments for limb-girdle muscular dystrophies. He was also CEO of Kinnear Pharmaceuticals and N8 Medical.



Denise M. Burcham ('87 BS) won a **2019 Distinguished Alumni Award for Career Achievement**. Burcham is the venture executive in the Major Growth Ventures organization of ExxonMobil Chemical Company in Houston. She focuses on commercializing new technologies and bringing new businesses to ExxonMobil Chemical Company. Previously, she was the Baton Rouge Plastics Plant manager for ExxonMobil Chemical Co., with eight production lines producing a large variety of specialty polymers. Burcham joined ExxonMobil in 1987 at the Baton Rouge Chemical Plant. After working in various plant engineering assignments, she was promoted into manufacturing management before moving to Houston in 1999. She serves on the CBE Advisory Board.

CBE Industrial Advisory Board meets



Faculty and Advisory Board members attending the October board meeting were (back, L-R): William Wang, David Tomasko, Li-Chiang Lin, Nick Brunelli, Stuart Cooper, Xiaoxue Wang, Winston Ho, Joel Paulson, Umit Ozkan, Jeff Chalmers, S.T. Yang, Jessica Winter, Andre Palmer, Lisa Hall, Bhavik Bakshi. (Front, L-R): **Drew Weber** ('82), **Aisha Barry** ('95), **Ron Harris** ('61), **Dan Coombs** ('78), **Rich Brandon** ('83), **Leonore Witchey-Lakshmanan** ('83, '84), **Alissa Park** ('05), **Mike Winfield** ('62), **Bob Tatterson** ('87) and **Raghavan Venkat** ('91, '95). Not pictured: **Denise Burcham** ('87).

John Kuhn wins research award, funding



John Kuhn ('07 PhD), an associate professor at the University of South Florida (USF) and a former member of **Umit Ozkan's** research group, was one of 12 USF faculty to receive USF's **2019 Outstanding Research Achievement Award**.

Kuhn's research, which has garnered national and international acclaim, focuses on heterogeneous catalysis and chemical reaction engineering

applied towards upgrading waste gases, including biogas and carbon dioxide.

In addition to several ongoing federal and state-funded projects where Kuhn serves as either principal investigator or co-PI, he was awarded a U.S. Department of Energy (DOE) BioEnergy Technology Office grant of more than \$1.8M to lead a team of university, national laboratory, and industry experts to convert biogas to value-added fuels and products.

Kuhn has published 64 peer-reviewed articles, with several in journals having an impact factor >10. In 2018 he was the lead researcher on three new patents and has a total of seven patents issued.

After graduating from CBE, Dr. Kuhn did his post-doctoral studies with Gabor Somorjai at UC-Berkeley before joining the faculty at University of South Florida.

Aisha Barry among Most Influential Women



Aisha Barry ('95 BS) was named among the "**2019 Most Influential Women in Corporate America**" by **Savoy Magazine** in July 2019. The prestigious list showcases a cross section of business leaders and executives representing a diverse range of industries with national and global focus.

Barry is general manager and vice president for patient management in Medtronic's Cardiac Rhythm and Heart Failure Division. In this role, Barry has accountability for the division's digital assets, including strategy, full operational P&L, research and development, and service operations. During her tenure, she has led the transformation of remote monitoring for patients with implanted cardiac devices, towards an integrated digital health care platform, including the launch of the MyCareLink Heart™ patient app and recently FDA-approved SmartSync Device Manager™. Going forward, her organization will play a critical role in delivering differentiated services and data and insights for key stakeholders, including patients.

"I'm humbled by this recognition but more so moved by the support network I've been blessed with to reach this point," Barry said. "I am a product of the people who have surrounded me with wisdom, care and constant encouragement."

Prior to Medtronic, Barry worked at Procter & Gamble for 13 years and held key product development and marketing positions. She later joined Deere and Company, where she held positions of increasing responsibility in operations.

Barry is a member of the CBE Industrial Advisory Board and the Jeremiah Program National Governing Board.



WOMEN.
INFLUENCE.
POWER.

Picture this!

A dusty attic, an old forgotten trunk... and a treasure inside.

Cheryl Moore, daughter of **Bob Jones** ('49), was cleaning out the attic when she discovered her father's stash of cartoons and drawings—and **Joe Koffolt's** portrait!



Before graduating from Ohio State's chemical engineering program, her father, Bob Jones, served in World War II and was stationed on a South Pacific island.

"Bob Jones was a good artist and drew cartoons related to the Pacific war, much like Bill Mauldin did of the European theater," said **Dr. Lloyd G. Jones** ('56, '59, '60), who learned about the portrait when Cheryl Moore gave a local program on her father's art. "The cartoons are quite pithy and good," Jones said.

"I became aware of Bob Jones the first time I met Joe Koffolt in 1956, because Joe asked me if I was related to him," Dr. Jones explained. "He had remarked, 'probably not, since you are only five foot nine and Bob is six foot eight.'"

After the war, Bob returned to Ohio State and did a lot of art work for Joe and the university before graduating. Bob went on to have an outstanding career in chemical industry management.

Ms. Moore kindly gifted the portrait to the department via Dr. Jones, who shared a few reminiscences along with the portrait (see next column).

Letterbox

"Joe Koffolt was one of those rare selfless people you meet once or twice in a lifetime. He was totally dedicated to his students and the chemical engineering department. Sort of hard to believe at first, but within a day or two of being around him you understood it was true.

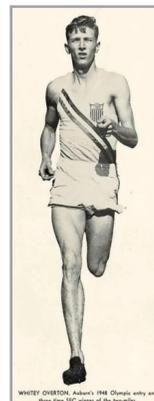
"He called all the students his 'boys' and watched out for us like we were sons. [Editor's note: During this period of the department's history, very few women were enrolled in the program.] He quickly knew every student, all their good points and faults, and genuinely tried to optimize their chances for success. And yet, he was no pushover. He had high standards and continually encouraged students and staff to meet them. People soon realized this and pushed themselves to meet those standards. He lost very few students to academic failure and was proud of obtaining engineering jobs for every graduate.

"Nearly everyone in the chemical industry knew Joe Koffolt and also knew of his love of cigars. He almost always had one in his hand or mouth. People gave them to him by the box. One evening he remarked to me that he had gone through 28 of them. He mostly just lit them and then chewed them when they soon went out. Unfortunately it probably caused his early death and we lost a prince of a man, but that was part of his persona and we loved him regardless.

"For me, Dr. Koffolt and Dr. Charlie Dryden were the keys to my entire research career. Both were outstanding practical engineers. Joe allowed me to get started by accepting and encouraging me as a graduate student after graduating as a petroleum engineer, and Charlie was my role model as an engineering researcher.

"I had a great career as a petroleum engineering researcher, much due to the advanced heat transfer course of Charlie Dryden. I was pleased to read of **Wolf Vieth's** ('58) success and remember him well as being in that class. Charlie provided me with a distinct advantage over my Mobil research colleagues and I wound up with more than 20 publications and over 50 U.S. patents. It is hard to overestimate the influence Dr. Koffolt's chemical engineering department had for my career and family.

- Dr. Lloyd G. Jones ('56, '59, '60)



Dr. William O. Overton, Sr. ('51 MS, '55 PhD) of Lancaster, OH, passed away on 7/1/2015.

Dr. Overton was an amazing Olympic athlete. He ran steeplechase for Alabama Polytechnic, now Auburn University, and was an Olympian in the 1948 London

Olympics. He worked for Shell Oil for 32 years, then worked for Premix, Bailey Corp., and was the president of E.P.I.C.

John Hoge ('55) chemical and mechanical engineering, wrote to us because he wanted to locate Bill and reminisce about their days at Ohio State. Sadly, we learned that Bill had passed away, but had been living nearby.

Hoge shared these memories of Bill Overton:

"Back around 1954, Ohio State had a strong intramural program, and Chemical Engineering had the championship team of the whole university. The team had fewer players than conventional football; I would guess six or seven. But 90% of our success was because of our two star players.

"We had a quarterback who could throw extremely long passes, and we had Bill, a 6'3" receiver who could out-run and out-jump everyone on the field. Having been on the U.S. 1948 Olympic Track Team, he could probably out-run and out-jump everyone in Columbus, including the Buckeye Varsity.

"My job, along with a few other dim-witted, slow linemen, was to give the QB enough time to get off the long pass. Happy memories I had wanted to share with Bill. I thought he was living in Houston, and had I known he was so close to me, I would have visited him. Don't wait too long!!"

- John Hoge ('55)

PHOENIX RISING: Old Unit Ops reborn as new biomedical/materials science engineering complex



-Photo by Geoff Hulse

As seen from the roof of the new Koffolt Laboratories, new construction stands on the former site of Unit Ops in old Koffolt. The rest of old Koffolt is being fully renovated to create the new Biomedical Engineering and Materials Science Complex (BMEC).

Fierce problems. Long, hot hours. And loads of coffee and Coca-Cola.

Many CBE alumni who graced Unit Operations in old Koffolt Laboratories never forget those days: a cauldron of intense, hands-on learning that not only gave alumni critical job skills, but the camaraderie and peer affiliations that often continue to this day.

Thus, news that old Unit Ops was demolished to make way for a new Biomedical and Materials Engineering Complex (BMEC) might lead to mixed feelings for some.

However, alumni can be consoled by CBE's current, much-improved Unit Ops, and the knowledge that chemical engineering researchers will soon have convenient proximity to other researchers involved in CBE's increasingly collaborative investigations.

Scheduled to open in summer

2020, BMEC will be a powerhouse, co-locating the Departments of Biomedical Engineering and Materials Science. It will showcase and inspire unprecedented advances in the rapidly growing field of biomaterials, leading to life-changing materials innovations impacting health, transportation, energy and more.

"This reimagined space will prepare Buckeye engineers to think creatively, problem solve and identify opportunities in ways that increase productivity, tackle global challenges and revolutionize products, services and systems like never before," said College of Engineering Dean David B. Williams.

The project's launch was celebrated on November 3, 2018 with a live (and loud!) demonstration of an explosive welding technology. Developed by Ohio State engineers, vaporizing foil actuator welding uses less than one-fifth the energy of

common welding techniques while creating bonds that are 50 percent stronger.

BMEC was designed to promote 21st century teaching and learning. It's five floors will feature updated computer, research and instrumentation labs, a 150-seat auditorium, a light-filled atrium with 20 collaborative and huddle spaces for students and faculty, an area for creative collaboration, and private spaces where industry partners can present new products and exchange intellectual property ideas.

"BMEC will also provide new teaching labs and an instructional high bay area that will change the way we teach the materials science and welding engineering programs," said Peter Anderson, then chair of materials science and engineering.

The building also features wide-open floor plans with moveable walls and modular equipment to afford flexibility for changing needs.

faculty news

ANDRE PALMER: OHIO EMINENT SCHOLAR

Professor **Andre F. Palmer**, one of the world's leading experts in blood substitute research and engineering, has been named a **Fenburr Ohio Eminent Scholar** (OES). The OES program, administered by the Ohio Board of Regents, was created in 1983 to enhance the national prominence of distinguished scholars across Ohio.

Palmer's research initiatives are of critical importance to human health, and could help save lives. For instance, with a looming threat of future red blood cell (RBC) shortages and increased demands posed by injuries, wars, natural disasters and routine surgery, he and his team are developing safe and efficacious RBC substitutes that could be used to sustain a patient who needs blood for up to 48 hours—enough time to get the patient to a hospital for a blood transfusion.

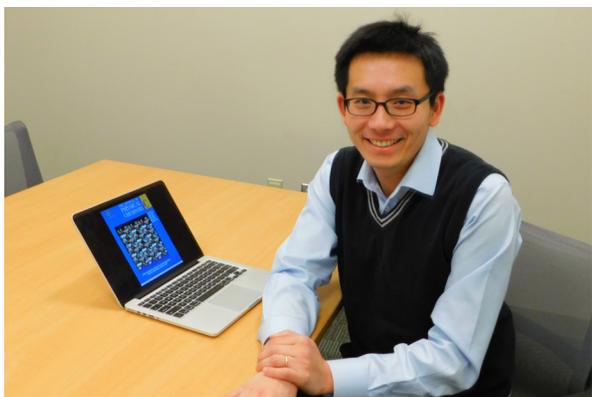
Palmer's research in biomaterials for transfusion medicine and tissue engineering has attracted nearly \$11 million in funding, including funding from the Department of Defense and four RO1s from the National Institutes of Health.

Funds from the OES will boost his program even further. "Support from the OES chair will give me the ability to work on high risk/high reward problems in transfusion medicine," said Palmer, who in 2015 was inducted into the American Institute for Medical and Biological Engineering (AIMBE), which comprises the top two percent of medical and biological engineers in the country.

Recently, Palmer and colleagues developed a treatment strategy for subarachnoid hemorrhage (*J Clin Invest.* 2019 Oct 22. pii: 130630. doi: 10.1172/JCI130630). In addition, Palmer has developed a novel strategy to manufacture apohemoglobin, a protein with many potential biomedical applications (*Biotechnol Bioeng.* 2019 Oct 15. doi: 10.1002/bit.27193).

He obtained his PhD from Johns Hopkins University in 1998.





LI-CHIANG LIN: OZKAN PROFESSORSHIP

Many young professors dream of holding a named professorship. The prestige is surpassed only by the benefits: more funds to advance one's research. For Assistant Professor **Li-Chiang Lin**, this dream has now become a reality—and very early in his career. Dr. Lin, who joined CBE in Fall 2016, has been named the first holder of the newly-minted Ozkan Professorship created by alumnus **William G. Lowrie** ('66).

Dr. Lin obtained his Ph.D. from the University of California-Berkeley in 2014 and first published in 2012 with papers in *Nature Materials* and *Nature Chemistry*. He now has 65+ peer-reviewed articles in high-impact journals, with recent publications in *Physical Review Letters*, *Journal of the American Chemical Society*, *Chemistry of Materials* and cover features in *Chemical Communications*, *Journal of Physical Chemistry C*, and more.

Dr. Lin performs computational studies using molecular simulations and quantum chemical calculations to identify novel, more energy-efficient and cost-effective materials with atomic-level understandings for energy- and environment-related applications.

He is excited because the professorship will help him explore more fundamental development of molecular simulations. "I will be able to support more students who can help advance the development of accurate intermolecular and intramolecular potentials to ensure reliable discoveries made by molecular simulations," he said. "This work represents a critical direction toward computational material discoveries." Molecular simulations require a set of mathematical functions to describe molecular interactions, and developing systematic and robust methodologies to facilitate the parameterization of these functions is of utmost importance.

Dr. Lin recently won the triennial award Excellence in Publications by a Young Member of the Society by the International Adsorption Society (IAS) for his contributions to the field.



LIANG-SHIH FAN: INDIAN NATIONAL ACADEMY

Professor **L.-S. Fan** has been elected a **Foreign Fellow** of the **Indian National Academy of Engineering (INAE)**, the country's most distinguished body of engineers, engineer-scientists and technologists.

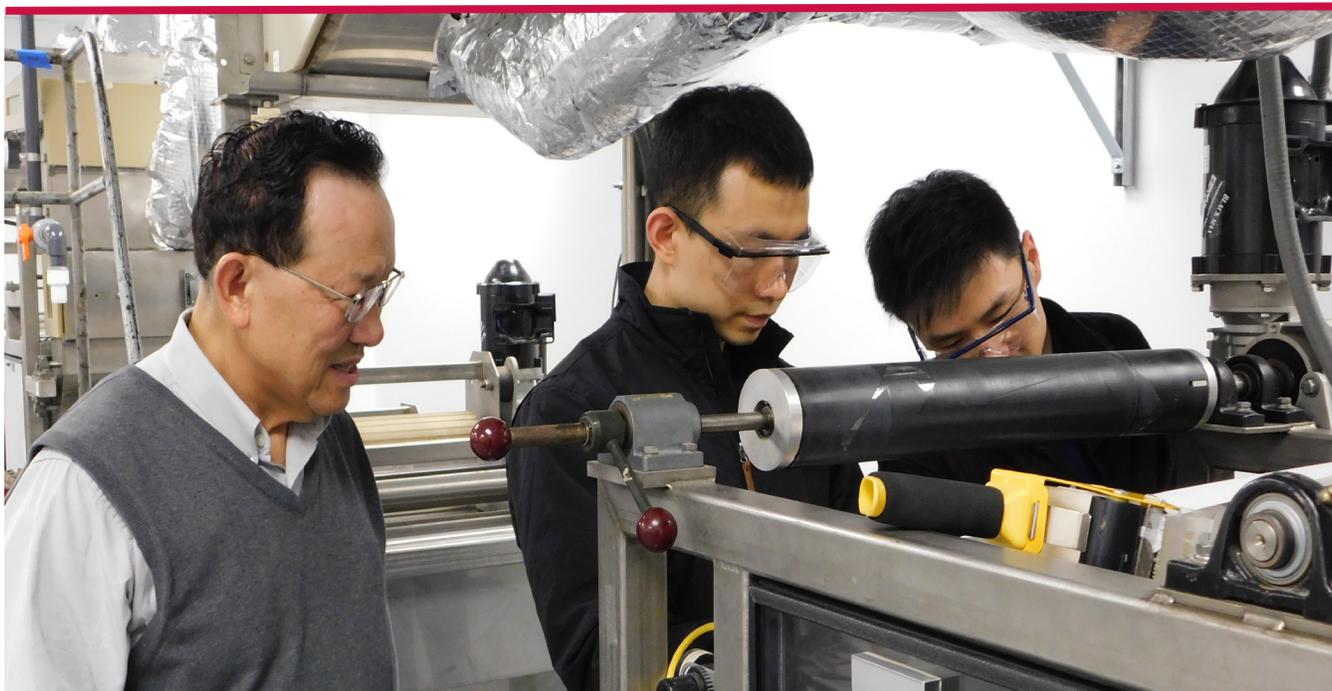
Fan is already a member of the United States' National Academy of Engineering (NAE). In addition, he is a Foreign Member of the Chinese Academy of Engineering and the Australia Academy of Technology Science and Engineering, the Mexican Academy of Sciences, and is an Academician of Academia Sinica, the highest form of academic recognition in the Republic of China in Taiwan.

The Indian National Academy of Engineering comprises engineers from the entire spectrum of engineering disciplines. Its main objective is to promote engineering and technologies in pursuit of the right solutions to problems of national importance.

The Academy confers Fellowship on Indian and foreign nationals who have demonstrated eminence in their own chosen area and achieved outstanding accomplishments in engineering and technology. Professor Fan's research fields are particle technology and chemical reaction engineering.

Professor Fan is one of the world's leading authorities on fluidization and multiphase flow, powder technology, and energy and environmental reaction engineering. He is an inventor of the leading clean-coal technology in the United States and in total, has invented eight clean fossil energy conversion processes for CO₂, SO₂ and NO_x emission control and electricity, syngas, hydrogen, chemicals or liquid fuels production.

He is also an inventor of the electrical capacitance volume tomography commercialized by a spinoff company for three-dimensional multiphase flow and structural materials imaging.



Professor **Winston Ho**, graduate student **Kai Chen**, and Research Scientist **Yang Han** ('18 PhD) adjust the membrane substrate on Ohio State's pilot continuous membrane fabrication machine.

W.S. WINSTON HO: MAJOR DOE SUPPORT

A new grant from the Department of Energy's Office of Fossil Energy solidifies Ohio State's leading role in carbon capture research. A team led by the Department of Chemical and Biomolecular Engineering's Distinguished Professor of Engineering **W.S. Winston Ho** will receive \$3.7M to develop and test innovative membranes for carbon dioxide capture from flue gas.

In April 2019 U.S. Secretary of Energy Rick Perry announced eight projects receiving nearly \$24 million in Department of Energy (DOE) funds for cost-shared research and development for Novel and Enabling Carbon Capture Transformational Technologies. The selected projects address scientific challenges and knowledge gaps associated with reducing the cost of carbon capture.

"By 2040 the world will still rely on fossil fuels for 77 percent of its energy use. Our goal is to produce them in a cleaner way," said Perry. "These projects will allow America, and the world for that matter, to use

both coal and natural gas with near-zero emissions."

Flue gas refers to the combustion exhaust gas produced at fossil fuel power plants. While membranes that can remove carbon dioxide from industrial gases are not new, there are no commercially available membranes to capture carbon dioxide from flue gas with marketable incentives. Professor Ho's spiral-wound polymer membrane modules demonstrate high carbon dioxide permeance and selectivity for enhanced gas separation, and are one of the most cost-effective membranes to date.

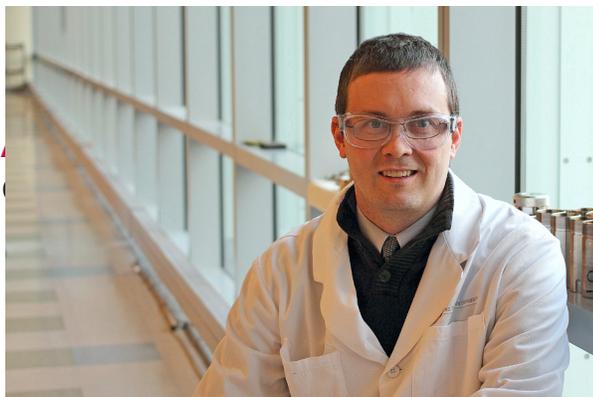
Ho, a member of the National Academy of Engineering, is passionate about his research, its potential benefit to the environment, and the economic advantages his membranes could provide to industries seeking emission control and associated by-products such as captured carbon dioxide. "Our novel membrane can capture at least 90 percent of the carbon dioxide in flue gas," said Ho, "and the purity of that CO₂ is at least 95 percent." Purity of the captured gas is important, since demand for quality carbon dioxide is growing in the oil, chemical and

food industries.

"We can capture carbon dioxide at a lower price than ever before, around \$40 per metric ton, and an even lower cost of less than \$30 can be achieved, if we only capture 70 percent of the carbon dioxide," he added. This efficiency could attract more industry interest in applying carbon capture technology to flue gas exhaust.

The researchers will optimize and scale up the membrane to a prototype size of 21 inches wide—half of commercial width—and about 1,000 feet long via continuous roll-to-roll fabrication. The membranes are then wound into modules to be used for simulated flue gas testing on a bench skid in the lab. After that, actual flue gas from coal combustion will flow through the membrane modules at the National Carbon Capture Center (NCCC) operated by Southern Company in Alabama.

These projects are funded by the Office of Fossil Energy's Carbon Capture Program. In addition to DOE research funding, the federal government also provides tax credits to fossil fuel companies that incorporate carbon capture and storage systems in their operations.



NICHOLAS BRUNELLI: AWARDS AND HONORS

The work of Professor **Nicholas Brunelli** has enjoyed increasing recognition and accolades in local and national honors.

Last year, he became the holder of the **H.C. "Slip" Slider Professorship** created by alumnus **William G. Lowrie** ('66). In recognition of the accelerated success Brunelli has been able to achieve with the additional support provided by the professorship, in October of this year the honor was extended from two years to five.

In August, he was selected for the 2019 Robert Augustine Award from the Organic Reactions Catalysis Society. The award, named after longtime ORCS contributing member Robert Augustine, honors catalysis scientists under 40 years of age who are achieving early career success. Dr. Brunelli will receive the award at the ORCS biennial conference.

Professor Brunelli has also achieved distinction in being named a 2020 Emerging Investigator by members of the Royal Society of Chemistry's journal, *Molecular Systems Design and Engineering*. In addition, he was named a 2019 Emerging Investigator by the Royal Society of Chemistry's journal, *Reaction Chemistry and Engineering*.

Further recognition came from the *AICHE Journal's* AIChE Futures feature. This honor included an invitation to present in the AIChE Futures session at the session at the 2019 AIChE Annual Meeting.

Locally, Dr. Brunelli received the 2019 Lumley Research Award from The Ohio State University College of Engineering for exceptional activity and success in pursuing new knowledge.

Last year, Brunelli was named to the American Chemical Society's 2018 Class of Influential Researchers list.

He received a National Science Foundation CAREER Award in 2017.



BHAVIK BAKSHI: TWO TOP AIChE AWARDS

Professor **Bhavik Bakshi**, an internationally-recognized expert on sustainability engineering, received two of the American Institute of Chemical Engineers' (AIChE) most prestigious awards in the realm of environmental and sustainable engineering: the **2019 AIChE Sustainable Engineering Forum Education Award** and the **2019 AIChE Lawrence K. Cecil Award in Environmental Chemical Engineering**, which also included the honor of presenting a lecture at the 2019 AIChE annual meeting. Both awards are highly regarded in the AIChE community and represent top-level achievement in the field.

Bakshi is known for his innovation of integrating systems ecology with systems engineering via thermodynamics in methods such as life cycle assessment, and for expanding the boundary of engineering to include the role of ecological and economic systems.

"By factoring in the role of nature in ecosystems, we can seek synergies between technological and ecological systems and discover novel win-win solutions," Bakshi said. For instance, he found that in the U.S., where technology is already being used to keep the air relatively clean, adding plants and trees to the landscapes near factories and other pollution sources could further reduce air pollution by an average of 27 percent (*Environmental Science & Technology*, November 2019 doi/abs/10.1021/acs.est.9b01445).

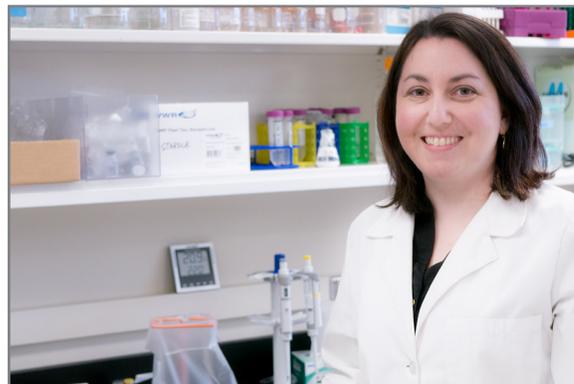
Previously, Bakshi won the 2012 AIChE Research Excellence in Sustainable Engineering Award. Earlier this year, he gave the D.B. Robinson Distinguished Lecture at the University of Alberta and published a textbook entitled *Sustainable Engineering: Principles and Practice*.

He was appointed to the Richard M. Morrow Endowed Chair in 2017.



-Photo: Josh Reynold

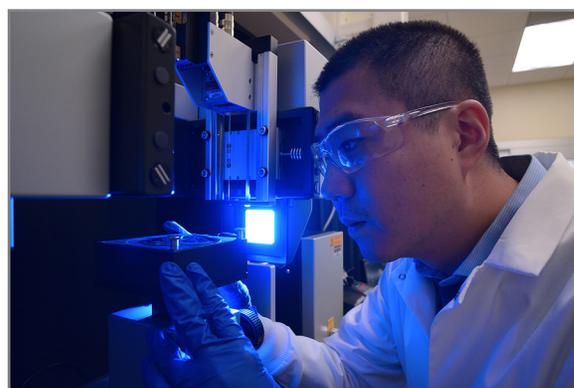
Lisa Hall was appointed Director of Ohio State's **STEAM Factory**. Its mission is to facilitate a culture of interdisciplinary collaboration and research within the scientific community and to bridge the gap between Ohio State and external populations.



Katelyn Swindle-Reilly was elected Program Chair, **Society of Biomaterials' Ophthalmic Biomaterials Special Interest Group**. She was also one of three finalists for the 2019 Ohio State University **Early Career Innovator of the Year Award**.



Eduardo Reátegui and **L. James Lee** won an \$800k Common Fund grant from the **National Institutes of Health** supporting their novel approach to extracellular vesicle (EV) analysis, which could significantly advance early-stage cancer detection and EV therapeutics.



Xiaoguang (William) Wang, who joined CBE in January 2019, published his first independent research paper. The article was published in the high-impact journal **Nature Communications**.



Jessica Winter gave the prestigious 2019 **Jacobus van 't Hoff Lectures** at the University of Delft, The Netherlands. Winter's talk was entitled "Encapsulating Hydrophobic Cargoes in Micelles via Scalable Nanomanufacturing Approaches." Her experience with scalable nanomanufacturing grew as a result of founding Core Quantum Technologies to commercialize her quantum dot imaging innovation, which tags molecules in biomedical tests such as those used in cancer detection.



Barbara Wyslouzil's article on carbon dioxide condensation onto alkanes was selected as a **2019 HOT Article** in **Physical Chemistry Chemical Physics**. The topic is relevant to selected low-temperature carbon capture schemes and to understanding the atmospheres present on some cold planets and their moons. Data used in the article was generated by Dr. **Yensil Park** ('19 PhD) as part of her doctoral research.



David H. Koch Chair Professor of Engineering **Paula Hammond**, head of the Massachusetts Institute of Technology's Department of Chemical Engineering, gave the 2019 Lowrie Lectures.

2019 LOWRIE LECTURES

PAULA HAMMOND MASSACHUSETTS INSTITUTE OF TECHNOLOGY

“ Chemical Engineering allows you to manipulate matter in new and exciting ways, to be able to build something truly incredible that hadn't been imagined before. By understanding how and why molecules assemble, flow, move and react together, it is possible to create, design and control a world of things. ” -Paula T. Hammond

Professor Paula T. Hammond is the David H. Koch Chair Professor of Engineering at the Massachusetts Institute of Technology, and the Head of the Department of Chemical Engineering. She is a member of MIT's Koch Institute for Integrative Cancer Research, the MIT Energy Initiative, and a founding member of the MIT Institute for Soldier Nanotechnology.

Her research in nanomedicine encompasses the development of new biomaterials to enable drug delivery from surfaces with spatio-temporal control. She also investigates novel responsive polymer architectures for targeted nanoparticle drug and gene delivery, and has developed self-assembled materials systems for electrochemical energy devices. She has designed multilayered nanoparticles to deliver a synergistic combination of siRNA or inhibitors with chemotherapy drugs in a staged manner to tumors, leading to significant decreases in tumor growth and a great lowering of toxicity.

Professor Hammond was elected into the National Academy of Engineering in 2017, the National Academy of Medicine in 2016, and into the 2013 Class of the American Academy of Arts and Sciences. She is the recipient of the 2013 AIChE Charles M. A. Stine Award, which is bestowed annually to a leading researcher in recognition of outstanding contributions to the field of materials science and engineering, and the 2014 AIChE Alpha Chi Sigma Award for Chemical Engineering Research.

Dr. Hammond has published over 320 papers and over 20 patent applications. She is the co-founder and member of the Scientific Advisory Board of LayerBio, Inc. and is a member of the Scientific Advisory Board of Moderna Therapeutics.

NANOLAYERED PARTICLES FOR TISSUE TARGETED THERAPIES

Layer-by-layer assembly provides an approach that allows complementary secondary interactions to generate a stable thin film coating which can contain a broad range of molecular and macromolecular systems. It can be applied to a range of nanomaterials that are of interest for cancer therapies, from solid nanocrystals that can act as imaging systems to nanometer scale drug containers such as liposomes or polymeric nanoparticles. This kind of approach offers the promise of delivery of a cascade of drugs in sequence, thus allowing for optimized combination therapy of synergistic drugs with therapeutic molecules such as proteins and siRNA.

The generation of LbL nanoparticles that can directly target specific tissues such as key organs is dependent on the nature of the outer LbL layer, and its net surface charge, degree of hydration, and type of polyelectrolyte bilayer pair that is adsorbed as the final layers on the nanoparticle. Recent work in which these nanoparticle systems are designed for optimized uptake by advanced serous ovarian cancer cells will be discussed, and the use of these approaches to deliver combination siRNA/chemotherapy or drug inhibitor combination therapies or to generate imaging systems and theranostic nanoparticles were addressed.

Dr. Hammond discussed the potential to target other tissues using designed nanoplex systems, in particular for the case of targeting cartilage to address the early stages of post-traumatic osteoarthritis. The manipulation of outer surface charge and polymer chain functionality, as well as the ability to design these layered nanoscale complexes to respond to micro-environment cues to achieve controlled biodistribution and uptake to targeted cells in vivo were described.

RESEARCH AND LIFE MATTERS: SEEKING PASSION AND SANITY IN CAREER

Scientific and engineering careers provide some of the greatest outlets for creativity, discovery, and fulfillment. Although there are many challenges to seeking a career in a field that can be both inspiring and, at times, discouraging, there are also strategies and perspectives that can help provide grounding and leverage efforts toward success. Flexibility is essential in the ways in which we connect research, life, career, family and other passions at different stages of life. These and other issues regarding research and broader aspects of career were discussed.

ACTIVE FACULTY



Aravind Asthagiri
Associate Professor



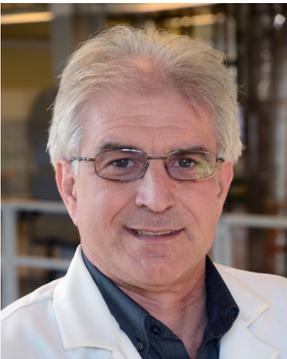
Bhavik Bakshi
Professor



Robert Brodkey
Professor Emeritus



Nicholas Brunelli
H.C. Slip Slider Professor



Jeffrey Chalmers
Professor



John Clay
Professor of Practice



Stuart Cooper
Professor



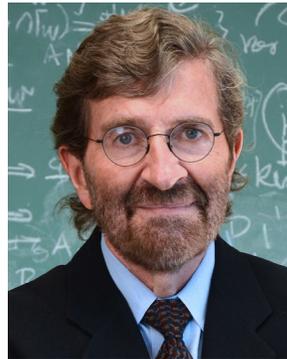
Paul Dubetz
Adjunct Asst. Professor



Ilham El-Monier
Asst. Professor of Practice



Liang-Shih Fan
Dist. Univ./CJ Easton Prof.



Martin Feinberg
Professor Emeritus



Lisa Hall
Associate Professor



W.S. Winston Ho
Distinguished Professor
of Engineering



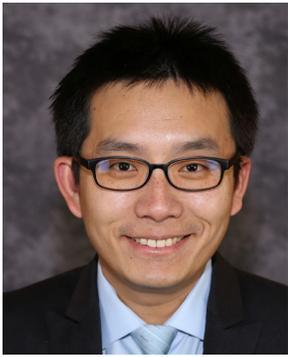
Kurt Koelling
Professor



Isamu Kusaka
Associate Professor



L. James Lee
Professor Emeritus



Li-Chiang Lin
Assistant Professor



Andrew Maxson
Asst. Professor of Practice



Umit Ozkan
Disting. Prof. of Eng.; Chair



Andre Palmer
Professor



Joel Paulson
Assistant Professor



James Rathman
Professor



Eduardo Reátegui
Assistant Professor



Katelyn Swindle-Reilly
Assistant Professor



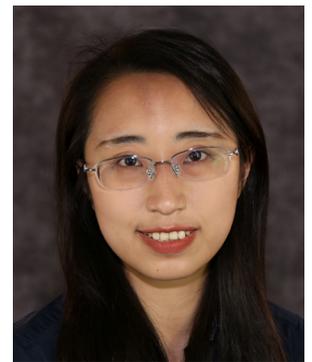
David Tomasko
Professor



Andrew Tong
Research Asst. Professor



William Wang
Assistant Professor



Xiaoxue Wang
Assistant Professor



Jessica Winter
Professor



David Wood
Professor



Barbara Wyslouzil
Professor



Shang-Tian Yang
Professor

graduate program



CHEMICAL AND BIOMOLECULAR ENGINEERING
AND CHEMISTRY BUILDING

Graduate students joining CBE in Fall 2019 bring the total number of students in the program to 90 doctoral and 21 masters students.



What's a great way to support CBE's undergraduate program? The answer may surprise you.

While most of our ~5,000 alumni graduated from CBE with bachelor's degrees, an important part of the chemical engineering program's overall health is its graduate program, which provides a foundation.

The graduate program is one of the primary elements that factors into the **U.S. News & World Report** rankings. This past March, among both public and private institutions nationwide, the College of Engineering's graduate program was ranked first in Ohio and 14th among all public universities in the USN&W Report's 2020 Best Graduate Schools list. At the department level, the William G. Lowrie Department of Chemical and Biomolecular Engineering's graduate program ranked #29.

While many people consider rankings to be important, there are other factors that contribute to student success, such as benefitting from hands-on experience and having good mentors. In this regard, a strong graduate program makes enormous contributions to the undergraduate experience.

Graduate students working as TAs provide critically-

important assistance to undergrads by serving as knowledgeable instructors, role models, and research mentors and collaborators. Many of our undergraduates who had the opportunity to study or work in the laboratory under the guidance of a graduate student have experienced stellar opportunities such as co-writing a patent application, being included in a peer-reviewed publication as an author, or even filing a patent or joining a start-up company.

Graduate students such as **Mandar Kathe** ('14 MS, '16 PhD) who recently won an Undergraduate Student Mentoring Award, take pride in mentoring undergrads and are vested in their students' success. "I feel very strongly about supporting our undergraduates," Kathe said. "They are talented, hard-working, and deserve every available opportunity I can provide."

If you would like to have an impact on the William G. Lowrie Department of Chemical and Biochemical Engineering, consider learning more about how its graduate program can deliver tangible, career-boosting benefits to undergraduates studying at Ohio State.



2019 Graduate Research Symposium

The 8th Annual Graduate Research Symposium was held on September 25, 2019 at the Blackwell Inn.

Thirteen representatives from partners including **Dow, Exxon Mobil, Intel, Kenexis, Lyondell Basell, pHMatter, Procter & Gamble, Smucker's**, attended.

Sponsored by **Dow Chemical Company**, GRS serves as a platform for graduate students to showcase their research and network with alumni and industry representatives, who get to see developments of potential interest to their companies and meet prospective hires.

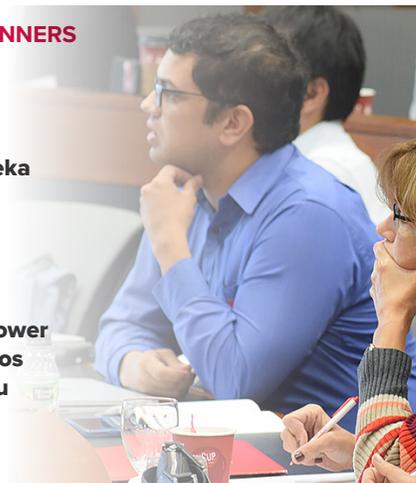
GRS AWARD WINNERS

Oral presenters

Deven Baser
Dhruba Jyoti Deka

Poster winners

Deven Baser
Yan Liu
Jonathan Hightower
Alexander Spanos
Changiong Zhou
Xiangming Gu



KEYNOTE

This year's keynote speaker was Sanofi Genzyme's Global Head of Biologics Drug Product Development and Manufacturing **Yatin Gokarn** (left), who is responsible for the development of clinical and commercial drug products for Sanofi's Biologics portfolio.

Gokarn holds B.S. and M.S. degrees in chemical engineering from the Institute of Chemical Technology in Mumbai. He obtained his M.S. and Ph.D. degrees in chemical engineering from the University of New Hampshire.

Graduate Student Organizations



ChemE Graduate Council (CEGC):
Elizabeth Jergens, Anagha Hunoor, Archit Datar, Nick Liesen, Mitch Weigand, Vance Gustin.



ChemE Hygiene Committee (ChyComm):
(Back): Ashwin Kane, Deeksha Jain, Donald Belcher, James Kim, Kevin Shen, Faiz Khan. (Front): Richard Hickey, Saurabh Ailawar, Elizabeth Jergens, Kayane Dingilian, Jackelyn Galiardi, Vyom Thakker, Yang Han.



Graduate Research Symposium:
(Back): Mitchell Weigand, Archit Datar, Saurabh Ailawar, Utkarsh Shah, T.J. Ghosh, Deven Baser, Vedant Shah. (Front): Dhruba Deeka, Dishari Basu, Mariah Whitaker, Abhilasha Dehankar, Deeksha Jain, Pinaki Ranadiv and Anagha Hunoor.

National **awards and honors**

Teng Bao (Advisor: Yang)

Teng Bao won one of 20 inaugural **ENGIE-Axiom Scholarships**, which were made across all colleges at Ohio State.

Bao is working to develop novel bioprocesses to convert industrial wastes, including agricultural residues and syngas, to biofuels such as ethanol and n-butanol.

The process, which utilizes engineered clostridia, is economical and can compete with current petrochemical products on the market.



Yiwen Gong (Advisor: El-Monier)

Sim Tech, LLC, headquartered in Houston, TX, is providing **Yiwen Gong** with a **one-year funded research opportunity**.

Gong is working with the company's data to analyze and solve problems and apply them in the field for the purpose of fracking horizontal wells.

She currently serves as president of the Ohio State chapter of the Society of Petroleum Engineers.



Deven Baser (Advisor: Fan)

Deven Baser attended the 2019 AICHE Annual Meeting in Orlando as a result of winning an **AICHE Catalysis and Reaction Engineering Division Travel Award**.

At the conference, Baser presented his paper, "Direct Decomposition of NO Using Specialized Metal Oxides in a Novel Chemical Looping Reactor System," which describes an invention that could be important for NO emission abatement from power plants.



Xilal Rima (Advisor: Reátegui)

Xilal Rima was one of 40 students nationwide chosen to participate in the University of Michigan's **NextProf Pathfinder Workshop**, which prepares early doctoral students for a successful Ph.D. graduate school experience.

Rima's research focus is cancer dormancy. Part of his goal in entering the academy is to encourage diversification and advocate for underrepresented engineering students.



Kayane Dingilian (Advisor: Wyslouzil)

Kayane Dingilian won 2nd place in the first-ever **American Association of Aerosol Research (AAAR) Video Competition** held at the organization's 2019 Annual Conference. AAAR is a premier scientific research organization that engenders high-quality aerosol research through its international forums and publications.

The assignment: Create a video of three minutes or less for a general audience that grapples with core AAAR content, is easy to understand, thought-provoking, and fun to watch. Finalist videos were displayed at a booth during the poster sessions.

Dingilian's video described the multidisciplinary approach to carbon capture initiatives, which seek to mitigate climate change by reducing the amount of carbon dioxide emitted into the atmosphere. Chemical engineers approach the problem from different angles, such as through the use of specialized membranes, computational modeling or chemical looping.

"I thought it would be cool to invite others in the department to speak on the carbon capture research they do and how aerosol research plays a role," Dingilian said.

Earlier this year, Dingilian won an honorable mention at The Ohio State University's 2019 Hayes Graduate Research Forum, where only five prizes were awarded in the Engineering Poster Competition, and a Top 10 Poster Award at The Ohio State University Institute of Materials Research's "Materials Week."

Local awards and honors

CBE students dominate Ohio State Materials Week



3-Minute Thesis: **Abhilasha Dehankar** (second from right) was first runner-up. Finalists were **Pinaki Ranadive** (third from right) and **Saurabh Ailawar** second from left).



Top 10 Posters: Out of 110 posters exhibited, the posters of **Deven Baser** (left), **Dishari Basu** (third from left) and **Saurabh Ailawar** (right) were selected for inclusion in the

At the 2019 Materials Week Conference held at Ohio State's Institute for Materials Research (IMR), 350 researchers from the University of Chicago, Purdue University, Honda R&D Americas, the Air Force Research Laboratory and Ohio State gathered to share knowledge and hone their skills

Two student competitions are featured during the week-long event, and CBE students earned seven of the 16 awards.

Three-Minute Thesis Competition

(three of six honors awarded:

- **Abhilasha Dehankar** (Advisor: Winter) was **First Runner-Up** for her presentation "Spatial interaction of inorganic nanoparticles in novel nanoparticle composites." Watch it at go.osu.edu/AD-3MT
- **Saurabh Ailawar** (Advisor: Ozkan) was one of four finalists for "Destroying water contaminants with swellable organically modified silica," viewable at go.osu.edu/SA-3MT
- **Pinaki Ranadive** (Advisor: Brunelli) was also a finalist for her thesis topic presentation, "Jet-mixing Reactor for Nanomaterial Synthesis." See the talk at go.osu.edu/PR-3MT

Top 10 Student Poster Competition winners:

- **Saurabh Ailawar**, who has won the same award three years in a row;
- **Deven Baser**, who also won an AIChE Travel Award this year;
- **Dishari Basu**;
- **Elizabeth Jergens** (not pictured).



undergraduate program

CBE'S UNDERGRADUATE PROGRAM RANKS #21

AMONG THE NATION'S BEST



In *U.S. News & World Report's* 2020 Best Colleges rankings, the William G. Lowrie Department of Chemical and Biomolecular Engineering's undergraduate program in chemical engineering ranked #21 nationwide, up from #27 last year.

Other Ohio State engineering undergraduate programs ranking among the nation's top 25 include materials engineering (13), industrial/manufacturing engineering (14), aerospace engineering (18), computer engineering (20) and mechanical engineering

(21). Civil engineering, electrical engineering and biomedical engineering programs also qualified to appear in this year's rankings, at 25th, 27th and 33rd, respectively.

U.S. News & World Report's rankings of ABET-accredited undergraduate engineering programs are based solely on the judgments of deans and senior faculty surveyed at peer institutions. Respondents are asked for nominations of the 15 best engineering programs in specialty engineering areas (such as chemical engineering). Entities receiving the most mentions in each area receive a ranking as long as the program received seven or more nominations in that specialty area.

INDUSTRY SUPPORTS PROJECT-BASED LEARNING

Hands-on learning is arguably the best way for a student to incorporate new knowledge, and Ohio State offers students multiple opportunities in this regard.

Some students choose to pursue research opportunities with faculty, and all students take at least two hands-on courses: the Unit Operations Laboratory, which trains students in the use of industry-scale equipment and procedures, and the Capstone Design course.

Capstone Design, otherwise known as Process Design and Development-CBE 4764, is the last required course in the chemical engineering undergraduate curriculum. The Capstone experience is taught primarily through project-based learning and strives to give students an opportunity to grapple with open-ended problems in which they don't have enough information and often don't even start with a well-defined question.

Projects are provided by faculty and a network of external partners who provide project ideas and host groups of students. For autumn and spring semesters in 2018-19, Capstone involved 61 projects, with each project involving four-five students. Eleven different faculty hosted 33 projects and 12 different outside partners hosted 28 projects. We would like to thank everyone who hosted projects this past year:

- **Adsorption Research Inc. - Kent Knaebel**, who taught in the Ohio State Chemical Engineering Department for 12 years
- **Barry-Wehmiller Design Group - Jacob Simko** (BS '17)
- **CDM Smith** - Ed Heyob (BS '99)
- **Entrotech - Andy Strange** (BS MSE '95) and Marissa McHugh (BS '16)
- **Honda North America** - Shubho Bhattacharya, Chris Cornelius, Chris Hall, and **Sally Yi** (BS '18)
- **Capital Resin Corporation** - Ed Toplikar
- **LyondellBasell Industries** - Vince D'Ippolito, Nani Deole
- **Middle West Spirits - Corey Hickman** (BS '17)
- **SmartColumbus** - Norman "Bud" Broughton
- **Waste2Worth - Jill Boughton** (BS '88)
- **Watershed Distillery** - Greg Lehman, Max Lachowyn
- **Wexner Medical Center** - Aparna Dial

Faculty included Jeffrey Chalmers, Ilham El-Monier, W.S. Winston Ho, Andrew Maxson, Andre Palmer, Eduardo Reátegui, David Tomasko, Andrew Tong, Jessica Winter, S.T. Yang, and post-doctoral fellow Mandar Kathé.

GET INVOLVED! If you would like to engage with our students by hosting a capstone project, please contact Dr. Tomasko (tomasko.1@osu.edu), Dr. Tong (tong.48@osu.edu) or Dr. Chalmers (Chalmers.1@osu.edu). Thank you for helping our students be the best they can be!

AICHe Chapter Activities

President **Josie Miller** and team have led an impressive array of activities so far this year.



In the **2019 Pie-A-Prof Fundraiser**, Professors **Nicholas Brunelli**, **John Clay** and **Li-Chiang Lin** helped students raise money for the AICHe BuckeyeThon team by allowing students to smash pies in their faces! Later that day, they endured a few questions from peers upon arriving to a faculty meeting with whipped cream behind their ears! (Thank you for being such great sports.)

Networking Night provided a great opportunity for students to engage with different companies and learn more about potential career paths. Representatives from **Anomatic**, **Dow**, **Ecolab**, **ExxonMobil**, **GE Aviation**, **Marathon**, **McCormick** and **Nalco Champion** met with over 200 Ohio State engineering students. Companies such as **ExxonMobil**, **Dow** and **pH Matter** held Information Sessions to meet students and explain career opportunities available with their companies.

Additional activities included the first **AICHe Mentor-Mentee Ice Skating Social**, the **2019 Pancake Fundraiser**, and a golf social.

We're hosting the 2021 AICHe Regional Conference!

At the 2019 AICHe Regional Conference in Toledo, our chapter put in a bid to host the 2021 AICHe Regional Conference -- and won!

In the spring of 2021, our student chapter will host the regional conference. This will be exciting!

Become an AICHe Professional Partner!

Want your company to be part of Networking Night?

Would you like to mentor a student?

Become an AICHe Professional Partner! Contact Matt Greenwaldt (greenwaldt.2@osu.edu) about sponsorships, event hosting, mentorship, and more!

Visit AICHe at <http://org.osu.edu/aiche/>

Recognizing leadership

ChemE Car

After great success at the spring Regional Competition in Toledo, ChemE Car qualified to compete in the Fall 2019 Nationals, and worked very hard to prepare for the event.

Despite challenges presented by the floor covering on the "race track," our team represented us well, coming in 5.5m from the line on their closest run and placing 16th out of 50 overall. Congratulations to all for an outstanding effort!

Led by President **Joe Gruber**, other officers include **Izzy Benintendi**, **Tim Choi**, **Garrett Croes**, **Steven Dengler**, **Daniel Fawcett**, **Joe Flory**, **Jeremy Janota**, **Erin Kelleher**, **Paul MacDonald**, **Kovid Misicka**, **Jamie O'Sullivan**, **Raghav Sahai**, **Yingjie Shi**, **Jack Thomas**, **Peter Tran**, **AJ Wahlstrom** and **Ben Waters**. (Advisor: Tomasko)

AICHe Chapter Officers



Back row, L to R: **Julie Gemmel**, **Siena Veurink**, **Eman Jallaq**, **Rebecca Dunne**, **Stiphany Tieu**, **Leah Soppi**, **Taylor Cochran**, **Josie Miller**, **Jessica Srail**, **Anjali Tewari**. Front row, L to R: **Matt Greenwaldt**, **Bryce Pember**, **Michael Petrecca**, **Luke Morrical**, **Bryce Bridges**, **Spencer Krebs**. (Advisors: Endres and Rathman)

Society of Petroleum Engineers

Talia Abedon, **Jackson Hise**, **Emily Fox**, **Aidan Brady**, **Izwan Zhuqairy Bin Iskandar Zulqaranain**. (Advisor: El-Monier)

Major benefits to **MINOR**

"I love the flexibility that a chemical engineering degree with a minor in petroleum engineering provides."

-Charles Vincent-Barr, '19

One of only 26 students in North America chosen to participate in Schlumberger's summer internship program in North Dakota, **Charles Vincent-Barr** is the second student to graduate from the department with a minor in Petroleum Engineering. (The first student, **Stuart Svetlak**, is currently training in Abu Dhabi with Schlumberger and is at the top of his class.)

Charles obtained the position after doing a video interview with a Society of Petroleum Engineering recruiter. Once on the Schlumberger team, he found that out of the 26 interns, only five had any training in petroleum engineering. "Having that background definitely gave me an edge," Charles said. "I was already familiar with certain concepts and could help explain them to co-workers who were struggling."

His peers included students from chemical and mechanical engineering, agriculture, and other disciplines. Schlumberger, he explained, strives for a diverse workforce because it finds that bringing different viewpoints to a problem provides an advantage in finding solutions. "I saw how people with a different background can see a problem in a different way than I can," Charles said.

As an intern, Charles worked on a team that located oil and gas pockets and set up the structures to extract it. Drilling two miles down and two miles out, the wells are then carefully cemented - a crucial step to protect the water table.

Schlumberger also performs well diagnostics on existing wells that help prevent accidents. A sensor wire is lowered two miles down into the well-- a process that can take several hours. An analysis of the data reveals whether the well's cement casing is cracked or damaged. If so, it must be retrofitted with a plastic liner.



During his internship, Charles worked six weeks straight, seven days a week, for 10-12 hours a day. Intensive shifts are common in this industry, since work locations are often remote. Regular employees might work in two-week rotations, or work for three weeks followed by one week off. Charles likes the flexibility of this arrangement, but it isn't for everyone. "I really like the lifestyle, but you need the backbone to get through those long days. I like it because when I work, I just want to work, and the rest of the time I can travel."

After graduating this semester, Charles will begin a full-time position with Schlumberger in Roma, Australia. He is impressed by the company's culture, and the benefits and treatment employees receive. New staff are provided with living quarters for the first year, and then receive a stipend to offset housing costs once they move off site. Employees also get a vacation allowance.

"Schlumberger says that its business has three areas of focus: 'People, Research, and Profits,' and they really live up to their word. People are first and foremost their top priority," said Charles, who is a Navy veteran and currently serves as the Student Veteran LGBTQ+ Programming Coordinator for Ohio State's Office of Military & Veterans Services.

Born to be a **BUCKEYE**

Born and raised in Westerville, OH, undergrad **Michael Hines** said he and his family bleed scarlet and gray. Hines chose to attend Ohio State not only because of the academic opportunities offered, but also to carry on a Buckeye family tradition. His great uncle was a former Ohio State University president and his grandfather was president of the alumni association.

On top of his course load as an undergraduate student, Hines became involved in pharmaceutical research, working with Chemical and Biomolecular Engineering H.C. "Slip" Slider Assistant Professor **Nick Brunelli**. He studied how to improve a specific catalyst and chemical reaction that could be used as a part of the pathway of chemical reactions occurring in pain relievers. Although the specific reaction he studied isn't currently in use, it could be one day.

"Mike has taken a research project from a mere suggestion to the point of publication in an area that bridges the research fields of chemistry and chemical engineering," Brunelli said. "He took on a leadership role in advancing our mechanistic understanding

of cobalt catalyzed hydrovinylation chemistry that has the potential to make pharmaceutical development more sustainable."

The research earned Hines and partner Montgomery Gray, a chemistry major, first place in the 2019 Denman Forum's science: statistical and mathematical modeling section. Presenting at the Denman also helped Hines hone his technical communication skills.

"Research has trained me in dealing with incredibly complex technical problems and trying to come up with creative solutions to solve the problems," Hines said. "But I think the more important thing for me is that it [provides] practice communicating technical problems to a wide audience."



Local awards

COLLEGE OF ENGINEERING

First-Year Design Showcase

Two hundred first-year Buckeye engineering students presented their unique solutions to a variety of real-world problems at the First-Year Design Showcase on April 22, 2019. The showcase culminates a Fundamentals of Engineering course that challenges students to work in teams to solve a transportation or global problem and build a real-life model as part of a semester-long design-and-build project.

CBE student accolades include:

First Place, Integrated Transportation Systems poster competition: **Alison Ritenour**;

First Place, Website competition: **Ryan Burrows** and **Alec Glenwright**;

Third Place, Advanced Energy Vehicle poster competition: **Emily Laudo** (pictured at right with team members).

College of Engineering Undergraduate Summer Research Scholarships (2018-19)

David Allen and **Thomas Porter** (Advisor: Winter)

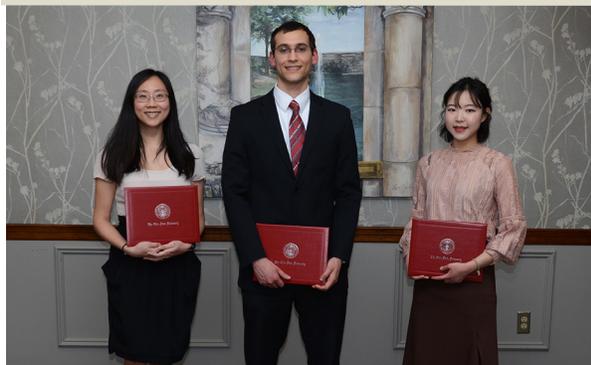
Peter Dent (Advisor: Koelling)

Gregory Halsey (Advisor: Satoskar, Microbiology)

Corey Sceranka and **Bryan Wynne** (Advisor: Ozkan)



student / staff awards



American Institute of Chemists Foundation Awards

Outstanding Post-Doctoral Award:
Lang Qin (Advisor: Fan)

Outstanding Undergraduate Award:
Ivan Pires (Advisor: Palmer)

Outstanding Graduate Student Award:
Eun Hyun Cho (Advisor: Lin)



AIChE Chapter Awards

Donald F. Othmer AIChE Sophomore Academic Excellence Award:
Matthew Polatas

Central Ohio Section Outstanding Student Award:
Julie Gemmel



AIChE Student Chapter Awards

Presented by AIChE President **Stiphany Tieu** (left):

Outstanding Community Outreach: **Kyle Langmack**

Outstanding Support of Undergraduate Education:
Mason Lilja

Exemplary Service and Leadership Award: **Jessica Males**



Undergraduate Patents/Publishing Award

Thomas Porter (with advisor, Jessica Winter)



Outstanding Undergraduate Award for Research Excellence

Michael Petrecca (Advisor: Fan)

Samantha Thobe (Advisor: Swindle-Reilly)

CBE Outstanding Graduate Student Award for Academic Achievement

Deeksha Jain (Advisor: Ozkan)
Tapajyoti Ghosh (Advisor: Bakshi)



CBE Outstanding Post-Doc Award for Research Excellence

Ruizhi Pang (Advisor: Ho)



CBE Chemical Hygiene Committee Award

Department-Wide Excellence in Safety: Ozkan Group



CBE Chemical Hygiene Committee Award

Outstanding Lab Safety: Palmer and Wood Groups



College of Engineering Staff Awards

Exemplary Team Performance Award: **Geoff Hulse**, director of computer services

Outstanding Service Award: **Wenda Williamson**, editor

Outstanding Service to Students Award: **Brian Endres**, manager of undergraduate advising.

Endres also won the **Outstanding Advisor Award** from the Academic Advising Association of Ohio.





Undergraduate Life



A portion of 2018-19 Unit Ops participants. Photo by Geoff Hulse.

Photo by
Geoff Hulse

1940s

John A. Burgbacher ('48 BS, '49 MS), of Kenner, LA, retired environmental engineer for Shell Oil Company, passed away on 5/27/2019.

David E. James ('42 BS, '48 MS), of Asheville, NC, retired director of engineering research at Kraft Foods Group, Inc., passed away on 3/26/2019.

James G. Hanlin ('47 BS), died on 7/9/2016.

Leland J. Lutz ('47 MS, '51 PhD), who previously worked as technical director for FMC Corporation, passed away on 3/23/2019.

Louis V. McIntire ('48 MS, '51 PhD), of Orange, TX, died 12/17/2018.

Allan L. Sluizer ('47 BS, '48 MS), of Bradenton, FL, who owned Urban Chemical of FL, Inc., died on 2/4/2017.

1950s

James O. Albery ('59 BS), of Nederland, TX, retired engineer, Texaco Inc., died on 10/27/2018.

Robert F. Aldrich ('52 BS), of Doylestown, OH, retired superintendent, PPG Industries, died on 10/23/2018.

Norman G. Bartrug ('51 BS), of Shelby, NC, retired senior evaluator for PPG Industries Inc., passed away on 6/29/2019.

Charles E. Golden ('56 BS/MS), of Lake Jackson, TX, retired technical manager at Dow USA Continental Operations, died on 5/29/2019.

John W. Roberts ('54 BS), of Columbus, OH, died on 6/3/2019. His last job was special usher at Ohio State's Schottenstein Center.



Harold A. "Hal" Sorgenti, 84, of Philadelphia and Palm Beach, FL, graduated from Ohio State in 1958

with a masters degree in chemical engineering. He became a highly successful inventor and leader in Philadelphia's business and civic communities before passing away on July 11, 2019.

He began his career in 1959 as a research engineer for Arco Chemical Co., obtaining 16 patents for various R&D chemical processes. In 1979 he was named President/CEO of Arco Chemical, leading a transformation that resulted in splitting the company into two entities — Lyondell Petrochemical, which became LyondellBasell, and Arco Chemical.

Sorgenti retired in 1991. For fun, he decided to co-found "a little chemical company" with a former colleague. "If it doesn't work out, so what?" he said. "And if it does, we'll give it to the kids." His partner handled the marketing side of the new company, Freedom Chemical, and Sorgenti led the financial and technology side, making products for the personal care, food and beverage, textile, and pharmaceutical industries. They acquired other small chemical companies and when sales reached \$350M, BFGoodrich purchased the company for \$375 million in 1998.

Sorgenti was a firm believer in the value of volunteer work. He served on numerous local arts, education, and humanitarian boards, not only because it was "important to the community," but because it was a growing experience due to interacting with so many different sorts of people.

Sorgenti created EMSCO Scientific Enterprises, a minority-owned provider of beakers, flasks, and disposable coveralls to laboratories. His goal was to help "reverse some of the unsettling trends that plague our cities." He also collected African American art and donated much of it to the Academy of the Fine Arts.

His efforts were recognized with awards from the Chamber of Commerce, the Martin Luther King Association Award for Corporate Justice, and the Penjerdel Council's William Penn Award, in addition to awards for service, business achievements, and leadership.

1960s

Eldred N. Cart ('60 MS), of Winston Salem, NC, retired senior staff advisor, ExxonMobil Corporation, died on 3/19/2018.

Alkis Constantinides ('64 BS/MS), of Princeton, NJ, engineering professor at Rutgers University, passed away on 11/10/2018.

James M. Flerchinger ('68 BS), of Solon, OH, who worked at MK Ferguson, passed away on 7/5/2018.

Myers G. Hammond ('63 BS/MS), of Prescott, AZ, retired research supervisor at El DuPont De Nemours & Co., died on 11/14/2018.

Stanley A. Metelko ('63 BS/MS), of Poteau, OK, senior process engineer, Maxus Energy Corporation, died on 10/16/2018.

1970s

Herbert R. Lander ('70 MS, '77 PhD), of Saint George, UT, retired consultant for Rockwell International Corporation, died on 11/23/2018.

Continued on next page.

In memorium

Philip J. Meves ('71 BS/MS), of Ashville, OH, retired division engineer, Abbott Laboratories, died on 12/23/2018.

Frank Song ('71 BS), of Statesboro, GA, who worked at Cleveland State University, died on 7/26/2019.

Dannie P. Maddox ('74 BS), of Waverly, OH, died on 2/28/2019.

1980s



Dr. Sunil Satija, age 62, passed away at his home in Washington Crossing, PA on May 16, 2019. He

obtained his chemical engineering undergraduate degree from the Indian Institute of Technology Kanpur, and completed a doctorate in chemical engineering at The Ohio State University in 1983. He had served on the department's Alumni Advisory Board for the past several years.

Dr. Satija had a successful career and was extremely devoted to his chosen profession of chemical engineering. He worked for 36 years in chemical companies such as Rohm & Haas and Arkema. Most recently, he was global process technology director at Axalta Coating Systems.

Dr. Satija will be missed by many of us in chemical engineering. In remembering Dr. Satija with admiration, Professor L.-S. Fan, Dr. Satija's former advisor, said "Of all the students I have ever had, Sunil was one of the brightest and most capable. His talents were extraordinary. I knew immediately that he was going to be very successful and make significant contributions to whatever activities he undertook."

1990s



Dr. Teng Ma, a prominent member of our discipline, earned his doctorate degree in chemical engineering

from The Ohio State University in 1999 with S.T. Yang as his advisor. He passed away unexpectedly on May 18, 2019. Dr. Ma had worked closely with several of Ohio State's biomedical engineering faculty, completing his postdoctoral work in the OB/GYN department of The Ohio State University Medical Center.

As a pioneering biomedical engineering researcher in the field of tissue engineering, he was the first professor hired into Florida A&M University-Florida State University's Department of Chemical & Biomedical Engineering who had specific training and research experience in biomedical engineering. When the Department sought to expand its biomedical engineering program with the specific goal of building upon the strengths and foundation of chemical engineering, Dr. Ma was an ideal fit, and he became the chair of FAMU-FSU's biomedical engineering department in 2014.

Dr. Ma was awarded four US patents and published over 100 highly-cited journal articles. He mentored many students who are now faculty members at major institutions, while others went on to positions in industry and government. His dedication to his department, his profession, and his students and colleagues was exemplary.

2000s

Matthew Workman ('19 BS), of Dublin, OH, passed away on 11/14/2018 and is sadly missed.

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