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Robert Frederick Smith School of Chemical and Biomolecular Engineering

OLIN HALL NEWS

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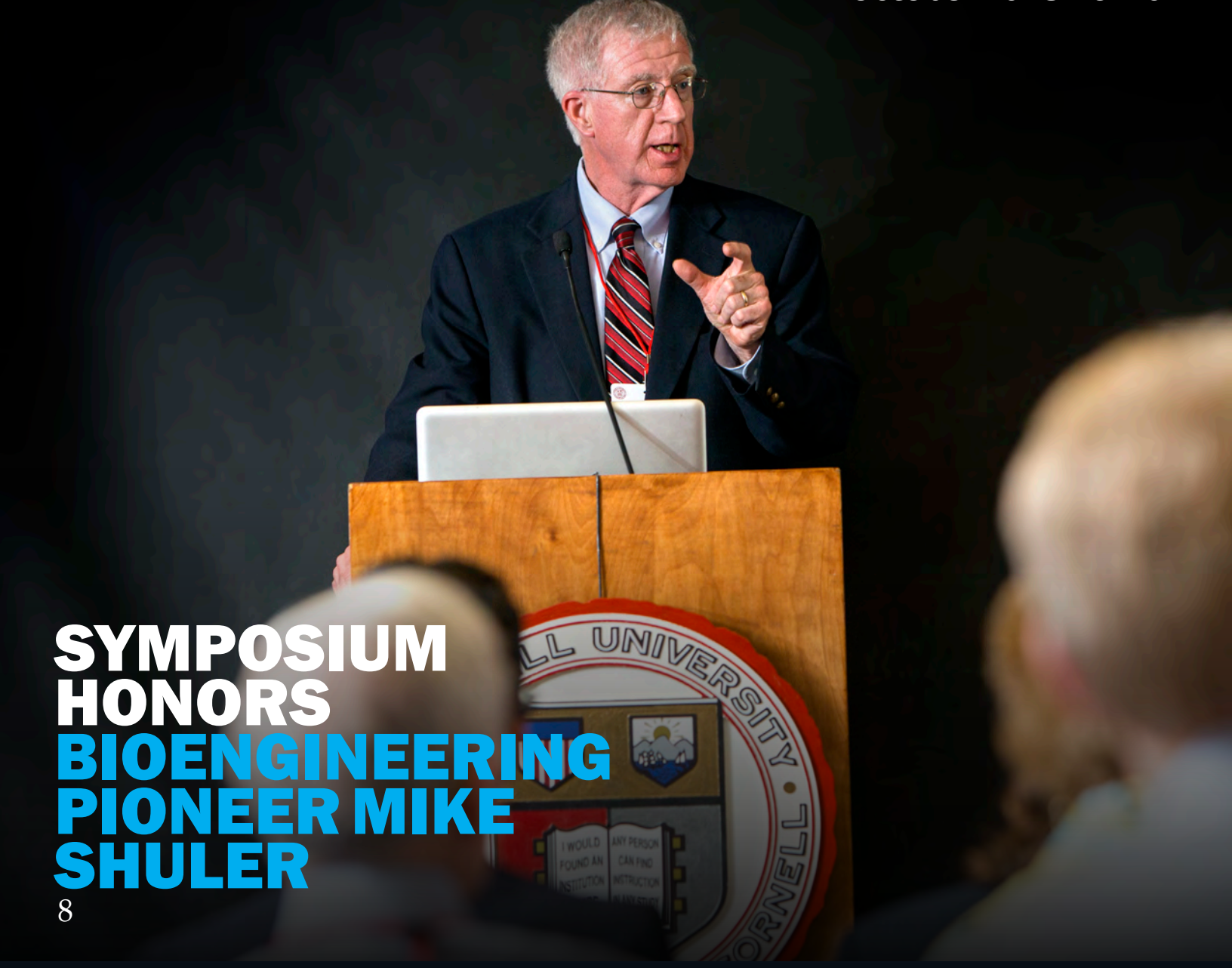


SYMPOSIUM HONORS BIOENGINEERING PIONEER MIKE SHULER

8

MESSAGE FROM THE DIRECTOR: ABE STROOCK

DEAR ALUMNI AND FRIENDS OF THE SMITH SCHOOL,

The view and prospects are still excellent from Smith School's perch up on Ithaca's East Hill. As the days grow cooler outside, the Olin Hall is warming up with the energy of new and returning students. They are taking on the classics (mass and energy balances, thermo, unit operations lab…), new challenges (biomolecular engineering, product design, sustainable energy systems…), and leadership roles across the campus in research, engineering project, the arts, outreach and mentorship. Our students are motors of activity and innovation.

With support from the school as Robert F. Smith Initiatives, graduate students launched a podcast series—Science Blender—from Olin (page 7) and organized Cornell's first graduate student reunion (keep an eye out for the announcement of next year's grad reunion). The UGs have also led Smith Initiatives. A particularly ambitious one—Chemical Engineering Crash Course or 4C—has developed curriculum and hands-on projects to introduce engineering principles to local high-school students (page 6).

Student profiles in this issue of Olin Hall News highlight the richness of student activities, from Grace Chuang '18 mounting an exhibit at the Johnson Museum (page 29) to Snehashis Choudhury, Ph.D. '18 developing competitive new battery technologies (page 28). It is a privilege for the faculty and staff to host all of this energy and talent each year. Luckily chemical and biomolecular engineering continues to attract the best and brightest.

To support this vibrancy, the school's faculty has been busy and growing. Our faculty continue to fill important leadership roles at Cornell: Lynden Archer has taken on the directorship of the Cornell Energy Systems Institute (page 20) and Jeff Tester (former director of the college's Energy Institute) has been named scientific lead on a university project to heat the campus with deep geothermal energy. Lynden has also been elected to the National Academy of Engineering (NAE) for the impact of his research and the excellence of his leadership (page 23). Chris Alabi and Fengqi You have been honored by awards from the American Chemical Society and American Institute of Chemical Engineers (page 23). Impressively, Matt Paszek won the coveted Tau Beta Pi teaching award, making it two in a row for the Smith School (Chris Alabi was honored last year).

We also had an exceptionally

successful year of hiring. Nick Abbott joined us this year from the University of Wisconsin to become a Tisch University Professor in the Smith School. Nick is a member of the NAE and a world-renowned innovator in the science and application of soft materials (page 22). In 2019, we will be joined by two junior faculty—Dr. Sijin Li of Stanford and Dr. Rong Yang of Harvard Medical School—who will broaden and deepen our strengths in biomolecular and biomaterials engineering.

This issue includes an article authored by Yong Joo, the BP Amoco/H. Laurance Fuller Professor of Engineering (page 2). He provides an inside view into the research activities of his lab on processing of advanced materials for energy applications, including a discussion of how he is moving his research into industry through entrepreneurial activities and collaborations.

Following up on the cover story from last year's Olin Hall News about the renewal of Olin Hall, starting in January of 2019, we will start a first phase of the renovation. College advising and registrar will be moving out of the first floor, allowing us to transform the second and third floors into state-of-the-art research labs. This project represents a major step toward the school having full ownership of Olin Hall (Dusty Rhodes' intent, of course) and the largest growth in our research footprint in 30 years. Continuing this momentum toward a complete renovation of the building is a major priority in these coming years to support programmatic growth and exciting new initiatives (see giving opportunities on page 36).

In closing, I point you to the cover story of this issue (page 8) on the symposium we held this past summer to celebrate the exceptional career of Mike Shuler. As many of you know, Mike has been a cherished colleague and mentor and an internationally respected scholar and innovator. We are lucky to have him continue as a colleague in an emeritus position. In other bittersweet news, Paulette Clancy also retired into an emerita position this summer to take on a newly created department head role in CBE at Johns Hopkins. She has been a pioneer as the school's first woman faculty member and as a leader in the use of molecular simulation in our field. She will be sorely missed as a colleague and leader at Cornell.

Thank you all for your engagement with the Smith School. As always, please be in touch and come visit us whenever you can!

Sincerely,

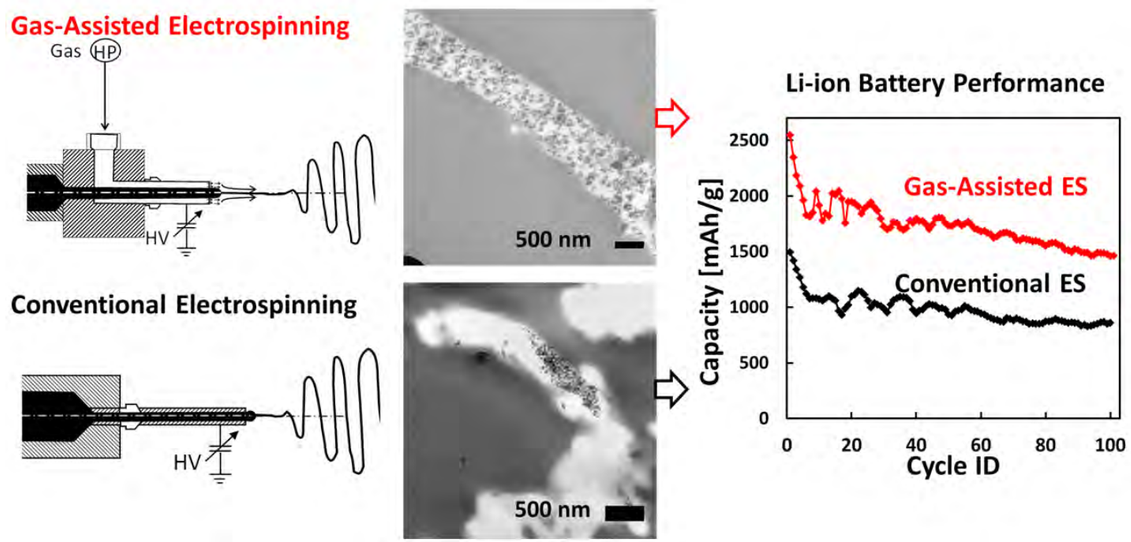
Abe Stroock
Gordon L. Dibble '50 Professor and
William C. Hooey Director

TABLE OF CONTENTS

Photos provided by Thomas Hoebbel Photography, John Reis Photography, and University Photography.

SCALABLE NANO-MANUFACTURING PROCESSES FOR HIGH PERFORMANCE BATTERIES WITH ENHANCED SAFETY

By Yong L. Joo, the BP Amoco/H. Laurance Fuller Professor of Engineering



Gas-assisted electrospinning, which utilizes both high electric field and controlled air flow, can produce nanofibers with tailored dispersion of nanoparticles.

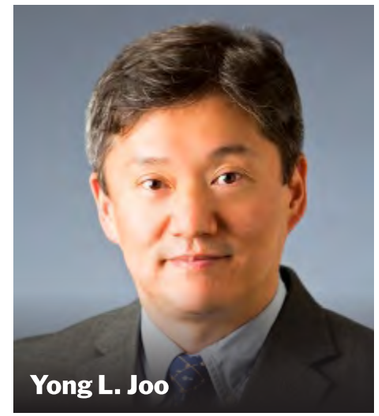
By working to control the formation of nanofibers and small droplets during processing of complex fluids, my research group is discovering new ways of making batteries better and safer.

Since joining Cornell in 2001, I have been working on the development of scalable nano-manufacturing processes that are mostly driven by the fluid instability. The first process that my group worked on was "electrospinning" where a high electric field is applied to draw a sub-micron scale fiber from polymer solution. Our aim was to understand the process behind the creation of the fibers, instead of relying on trial and error.

We utilized modeling and theoretical analysis, which gives us an edge in attempting to improve the process. Nanofiber from this conventional electrospinning process was limited because the production rate is low and the operating cost is high. We eliminate the use of solvent, and at the same time, based on the understanding of the process, we refine and augment this process to improve speed of production and control over the products.

We first removed the solvents and began experimenting with water-based electrospinning which allowed us to add a large amount of metals and ceramics to the nanofibers, creating new hybrid materials with promising properties especially as battery materials.

Secondly, we added more power. Typically, we just use the electric field as the driving force, but we added high-speed, controlled air. So there are two driving forces—that's what makes it so effective and synergistic. This modified process is called "gas-assisted electrospinning." We first filed a series of patents on this new process and its applications, and published papers demonstrating the basic concepts behind the process as well as implications of process modification on the final performance of materials.


Yong L. Joo

COMMERCIAL APPLICATION

When I co-founded a start-up company, Axium Nanofibers, with entrepreneur Eric Donsky seven years ago, the company obtained the exclusive license of this high throughput, gas-assisted electrospinning process from Cornell. The battery components were initially created by putting novel nano-materials through this process which results in high quantities being created at a lower cost with improved control of the assembly of nanoparticles in the fiber (see image on page 2). Within this process, the fibers extend and become thinner because of the synergy between controlled gas flow and high electric field.

Despite the enhanced scalability and superior tunability of material assembly by gas-assisted electrospinning, stacking of nanofibers with a lot of pores among them generally leads to low bulk density materials, meaning that with the given space, you can't put in a large amount of the material. Initially, we thought that if we made good materials, battery manufacturers would use them. But this industry wants electrode materials with high density that are ready to be used in their systems without modification. So we took it back to the drawing board.

Since then, our process has evolved again—instead of fibers, we're now able to use the same combination of forced air and electric field, but this time to create small droplets that form a film. In other words, our group has moved from electrospinning fibers to electrospraying droplets. The deposition of the sub-micron scale droplets makes a very dense coating or film that can resolve a lot of issues we had with the fiber-based system. Dubbed "air-controlled electrospray," this new process achieves what many had been chasing in the battery field: scalability with dense but controlled assembly of nanomaterials.

Electrodes and separators based on scalable nano-manufacturing processes such as gas-assisted electrospinning and air-controlled electrospray are about to be used in breakthrough batteries that deliver much higher energy density than conventional technologies and can be successfully scaled to be cost competitive with enhanced safety. But I'm just as excited at unlocking the fundamental secrets behind the creation of these materials and creating the synergy among the components.

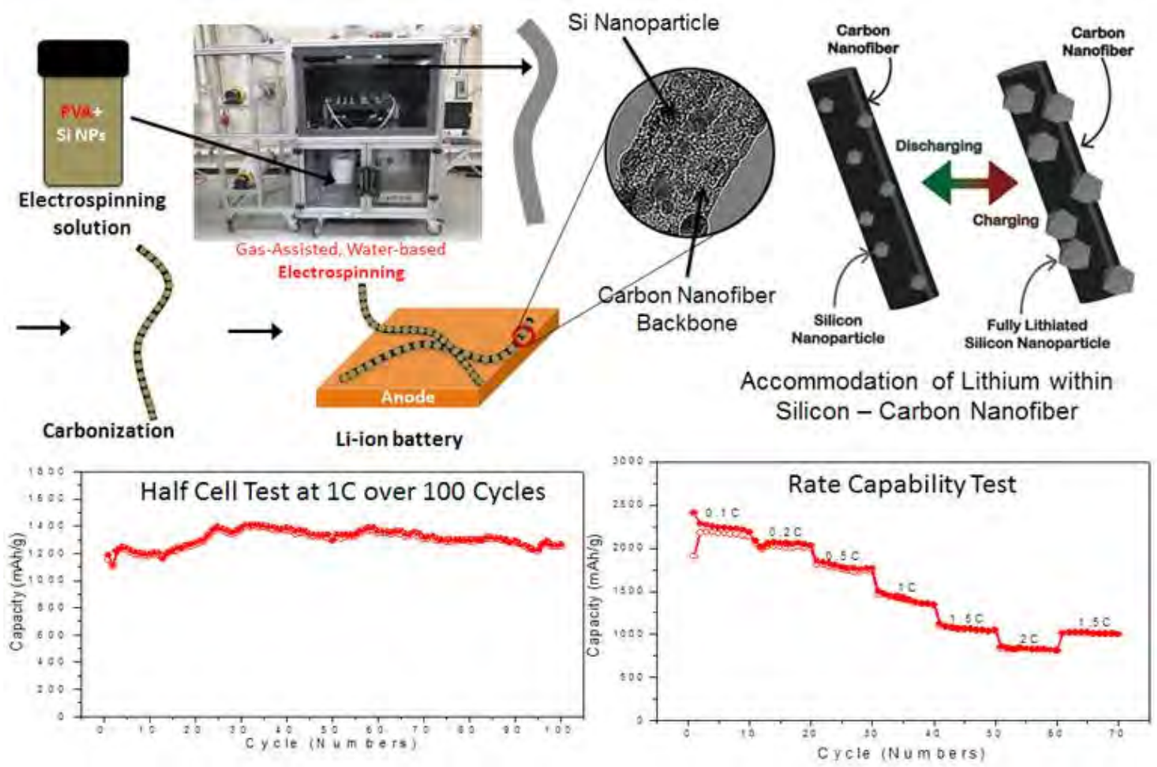
A lot of understanding the interplay among battery components is needed in both studying the process and developing the process for next generation batteries. Instead of focusing one battery component,


From left: Anil Netravali, professor of fiber science and apparel design, and Yong Joo, professor of chemical and biomolecular engineering, in the lab with postdocs working on new high efficiency air and water filters based on biomaterials.

we are looking at how we can take scalable nanomanufacturing processes, and improve on what's being done and create synergy among the components. Being able to produce anode, cathode and separator with gas-assisted electrospinning and air-controlled electrospray makes its integration into the overall system much easier.

In December 2017, my start-up, Axium Nano, signed a Joint Development Agreement (JDA) with the leading automotive company, Daimler AG, to commercialize polymer/ceramic hybrid separator material we developed for use in lithium ion batteries. Battery separators are intended to ensure battery safety and to also facilitate ion transport between the positive and negative electrodes, determining the rate of charge and discharge of the battery. Our novel separator material was independently tested by General Motors and demonstrated a 2x faster recharge rate than commercial polyolefin and coated polyolefin separator materials while being far more thermally stable and non-flammable, features critical to consumer safety.

This JDA with Daimler is initially focused on the commercialization of the polymer/ceramic separator as consumer safety is Daimler's primary directive of their electric vehicle business and they believe that this separator material is far more advanced than current commercial separators. Axium's



Schematic of fabrication of silicon rich carbon nanofibers via multi-nozzle, water-based, gas-assisted electrospinning and the cyclic performance and rate capability test of the resulting nanofibers as lithium-ion battery anode.

"IF YOU DO COLLABORATE WITH INDUSTRY, BEING A PROFESSOR AT CORNELL GIVES A LOT OF BENEFITS BECAUSE OF OUR EXTENSIVE NETWORK OF ALUMNI. IN MANY CASES, YOU CAN FIND AN ALUM WORKING IN THE INDUSTRY, AND THEY VALUE CORNELL QUITE A LOT."

— Yong L. Joo

R&D team members, who are mostly graduates from my research group, are working closely with Daimler to complete battery tests with three different sizes to further validate the performance and safety of this separator material and demonstrate the ability to scale manufacturing. I am collaborating with its engineering partners to assemble a fully integrated pilot plant to manufacture these samples for Daimler's testing.

SOLID STATE ELECTROLYTE

My group also has been working on safer electrolytes that can replace the hazardous/flammable liquid electrolytes used in conventional lithium-ion batteries. We've developed a novel gel electrolyte and are also working on a solid-state electrolyte system. A solid-state battery system is the "Holy Grail" because of its safety. The main challenges are cost and rate capability. Lithium ions can travel the fastest in a liquid electrolyte and are challenged to diffuse quickly through solids. Consequently, the recharge rate of a battery would be very slow using a solid electrolyte unless major innovations could be actualized that facilitate rapid ion transport through solid materials and solid-solid interfaces.

My work in ceramic/polymeric hybrid separators with high thermal stability and rate capability establish essential building blocks for the solid and/or gel electrolyte to realizing this high value R&D target.

In addition, I have been developing all the materials that comprise a breakthrough lithium sulfur battery. My group has developed a lithium sulfur cathode with high sulfur loading and superior rate capability. This cathode uses elemental sulfur that costs less than $100/ton versus $100,000/ton for the cost of cobalt used in a lithium-ion battery cathode.

The development of a solid-state electrolyte would be critical to the successful commercialization of lithium-sulfur batteries because of the safety risks associated with lithium metal anodes. We're developing this next generation battery as a part of the U.S. Department of Energy Battery 500 Seedling Project whose purpose is to identify proof-of-concept that will complement the research in the Battery 500 Program to research, develop and demonstrate lithium-battery technologies capable of achieving a cell specific energy of less than 500 Wh/kg while achieving 1,000 cycles. Maximizing the synergy among a highly loaded sulfur cathode, a thermally-stable and high-rate separator with functionalized graphene coating, and a gel (solid) electrolyte via scalable nano-manufacturing processes is critical to realize the premise of lithium-sulfur batteries in near future.

A NEW PERSPECTIVE

The wait and work have been worthwhile, however, because the process has given me a new perspective. My whole experience, going through this startup, gave me a broader perspective on how to run the research program here. After all, we are in engineering, so whatever you do eventually has to be linked to the benefits of humankind. We have a strong footing in fundamentals, but having some exposure to the real-world application provides new angles for tackling problems. That has been very valuable.

It should be noted that being able to understand the fundamentals of nano-manufacturing processes and apply them to emerging areas would have not been possible without hard work of numerous talented and motivated group members: undergraduate researchers, graduate students and postdocs. These new considerations have benefited students, giving them more diverse exposure to fundamental as well as applied research and entrepreneurship. It can be a new way of thinking and linking to a career path. As opposed to working for a large company or becoming an academic, this is another option. It basically diversifies the possibilities, and there may be a lot of students who really fit this kind of path.

Alumni working in industry, in turn, can help more students—and professors—bridge the gap between the university and industry. If you do collaborate with industry, being a professor at Cornell gives a lot of benefits because of our extensive network of alumni. In many cases, you can find an alum working in the industry, and they value Cornell quite a lot. As this view into my lab's research trajectory illustrates, here in the labs of Olin Hall, we build on the foundations of chemical engineering to extend the field into important, exciting new areas of urgent relevance to the industrial challenges of our time.

CBE PODCAST AND HIGH-SCHOOL COURSE AIM TO MAKE ENGINEERING ACCESSIBLE

Robert Frederick Smith

The thought of studying chemical and biomolecular engineering at Cornell can be intimidating for a high school student or anyone not accustomed to the field. Some may not have the confidence they can succeed at an Ivy League institution, while others may simply wonder what, exactly, chemical engineering is.

Two new Smith Initiatives aim to make engineering more inclusive by helping young students envision themselves as engineers. The initiatives offer a window into chemical and biomolecular engineering, from curriculum and research to the different personal challenges that engineering students face.

The initiatives are funded by a gift from entrepreneur Robert F. Smith '85 and his Fund II Foundation, which committed $50 million in 2016 toward endowments to support chemical and biomolecular engineering at Cornell and to support students traditionally underrepresented in the STEM fields.

THE NEWLY FUNDED INITIATIVES ARE:

4C: CORNELL CHEME CRASH COURSE FOR HIGH-SCHOOL STUDENTS

Akash Vaidya '18 remembers feeling uninformed when the time came for him and his high-school classmates to choose a college major.

"Chemical and biomolecular engineering sounded interdisciplinary and thus more interesting than other majors, but we really had no idea what we were in for," said Vaidya. "We were once hesitant to become engineers because four years ago we didn't know what that entailed. It's scary to think about how close we were to missing this exciting opportunity."

That's why Vaidya and Joseph Hassler '18 helped develop Cornell ChemE Crash Course, or 4C, which invites high-school students to attend a multi-week course at Cornell designed to expose students to various engineering fields through common chemical engineering applications.

The initiative launched in spring of 2018 when Vaidya and a group of seniors invited 20 Ithaca High School students to attend four weekly lessons in Olin Hall. Each lesson taught general engineering through interactive presentations and engaging activities. The lessons also introduced chemical engineering challenges in popular fields.

For the first lesson, students applied limiting-factor analysis to understand and manipulate drug release from hydrogels. The following week, they used mathematical analysis and computational tools, such as Microsoft Excel Solver, to optimize the power output of berry-based solar cells. Students also used graphical analysis and physical intuition to develop and apply predictive models for heat transfer. In the final lesson, they learned to reduce complex systems to unit operations, which helped them design and execute separations processes to maximize return on investment.

"The course encouraged critical thinking and collaborative learning, and it introduced our students to general engineering principles," said Vaidya. "They applied what they learned to define problems, design experiments and brainstorm creative solutions, and thus gained first-hand experience with basic engineering. Most importantly, they had fun doing it."

The students managing 4C next year hope to build upon the initiative with the goal of expanding its reach to high schools farther from Cornell, such as Groton, Dryden and Cortland. They also aim to include students from demographic and socioeconomic backgrounds that are traditionally underrepresented in STEM fields.

The inaugural FourC team included Akash Vaidya '18, Joseph Hassler '18, Anderson Luke '18, Allen Jiang '18, Doris Chen '18, Peter Romero '18, Francis Ledesma '17, Swetha Thiagajaran '16 and Jay Bender '16.

SCIENCE BLENDER PODCAST

Behind every discovery at the Smith School is an engineer with an inspiring story to tell. Science Blender is a student-produced podcast that aims to tell those stories.

The idea was conceived by graduate student Aravind Natarajan, who not only wanted to highlight current advancements in biomolecular engineering, but wanted to create a compendium of role models that could inspire the next generation of engineers.

"We want to talk about the great science that is done, but we also want to blend in their personal story so there's more of a connection to the listener," said Kevin Weyant, Ph.D. student and co-executive producer of Science Blender.

The podcast examines the personal drive of each engineer it profiles and how those people cope with the ups and downs of the research process, added Joseph Brown, Ph.D. student and co-executive producer.

"We want to emphasize that people who do science come from different backgrounds and there's a variety of challenges they face when they get here," said Brown.

The pilot episode profiles Michael-Paul Robinson, Ph.D. '17, who discusses his academic journey as a first-generation, African-American student. Robinson details how he was convinced to apply for graduate school by one of his mentors, as well as the pressure he felt to succeed as a first-generation student. The episode then turns to his work in the DeLisa Lab, where his research focused on how antibodies can be efficiently produced in bacteria.

Brown said the podcast is produced mainly for a high school and undergraduate audience, so the science is explained in an accessible way that highlights how discoveries in the lab can improve lives.

Five episodes of Science Blender are currently available and new episodes will be released about every six weeks. The short-term vision is to continue profiling engineers within the Smith School, although the podcast's producers said it could expand beyond chemical engineering in the future. And as the podcast continues to grow and refine its style, Brown said its overarching theme will remain the same.

"It's important for those high schoolers and those undergrads who listen to realize a lot of people go through different types of challenges—maybe it's race or gender or how they identify themselves," said Brown. "We want them to hear that and understand that a lot of people struggle with those problems and they can identify and say 'maybe I can consider graduate school, too.'"

Science Blender is available on Stitcher, iTunes, Google Play and online at ScienceBlender.com. The production team includes Cornell graduate students Joseph Brown, Kevin Weyant, Charlie Heinke, Alicia Aquino, Abhishek Sharma, and engineering researcher Laura Sinclair.

SYMPOSIUM HONORS BIOENGINEERING PIONEER MIKE SHULER

Scientists from around the world gathered at Cornell on Friday, June 22, to honor the career of Professor Michael Shuler, whose work in modeling biological systems continues to revolutionize the field of bioengineering and change the way pharmaceutical drugs are developed and tested.

A day-long symposium hosted in Klarman Hall featured talks from over a dozen academics and industry engineers who discussed how Shuler, who recently received emeritus status as the Samuel B. Eckert Professor of Engineering, changed bioengineering while also serving as a soft-spoken mentor whose guidance was relied upon by many.

"Mike thinks differently about research problems than almost anybody—than engineers do, than biologists do, than doctors do," said Abe Stroock, the William C. Hooey Director and Gordon L. Dibble '50 Professor of Chemical and Biomolecular Engineering. "If you didn't know any better, you might think he was a little out of whack in how he was defining his problems and pursuing them."

When Shuler was hired in 1974 as a professor of chemical engineering at Cornell, he began to apply principles of chemical engineering to understand how cells worked, and sought to build in vitro systems that could quantitatively simulate biological ones.

"In the earliest days when both biologists and engineers assumed that a living cell was an intractable mess, Mike set out to write down the equations that define its dynamics," said Stroock, speaking to about 160 people attending the symposium. "He used computers that were less powerful than a hand-held calculator today to take a chemical engineering kinetics approach to understanding metabolism and signaling and gene regulation. He was doing systems biology 20 years before that term existed."

Michael Shuler, the Samuel B. Eckert Professor of Engineering Emeritus, speaks in Klarman Hall during a symposium honoring his career.

Michael Shuler, the Samuel B. Eckert Professor of Engineering Emeritus, listens as former students pay tribute to his career during a dinner in his honor.

Shuler's early work at Cornell led to the first chemically-accurate mathematical model of an organism. The model, published in 1984, could predict the changes in composition, size, and shape of a single E.coli cell, as well as the timing of its chromosome synthesis in response to changes in external glucose limitation.

"MIKE THINKS DIFFERENTLY ABOUT RESEARCH PROBLEMS THAN ALMOST ANYBODY—THAN ENGINEERS DO, THAN BIOLOGISTS DO, THAN DOCTORS DO."

— Abe Stroock

Soon after, Shuler and other engineers began to see cells as bioreactors for drug production. As industry and academics were trying to converge on just a few cell types to be the work horses of biomanufacturing, Shuler began working with insect and plant cells, "off in left field…in a place where very few people were going to follow him," as Stroock described it.

But Shuler proved those cell types could be used as powerful platforms for the production of pharmaceuticals like chemotherapeutics. In 1995, he published a study that showed bioreactors could be used to mass-produce Taxol, a compound used in cancer-fighting drugs that, until Shuler proved otherwise, could only be sourced from the bark of the Pacific yew tree.

Shuler said he first entered the field of chemical engineering because of his interest in drug manufacturing to save lives, but over the course of his career he grew more intrigued with chemical engineering's role in learning about how life works.

By 1989, Shuler sought to model human organ systems, and set out to design a device that could act as a surrogate for real organs. He envisioned the impact such a device could have on society, including for people like his youngest daughter, Kristin, who has Down syndrome.

"People with Down syndrome have an extra chromosome and many times physicians are reluctant to prescribe drugs because the extra chromosome may react different to the drug," said Shuler. "So we'd like to be able to capture that in a model and that was one of my main motivations—doing something to help people like Kristin."

Shuler spent the next 20 years engineering physical models to represent mathematical models of the human body—research that, at first, received little attention from the rest of the science community.

"Funding was a little more scarce," said Shuler.

But during that time, he had persevered to develop a new set of approaches on tissue engineering, drug discovery and toxicology with his so-called body-on-a-chip, a microfluidic device that can replicate the functions of organs and tissue.

Beginning in 2004, Shuler began publishing studies that showed it was possible to co-culture different organ-derived cells on a small, in vitro chip that could then be used to observe the complex responses human organs would have to cancer medication. Until the invention of the body-on-a-chip, animal testing was the only reliable way to achieve the same observations.

Shuler's work birthed a new field in bioengineering, and today, body-on-a-chip systems are an exciting area of science being explored by many scientists and engineers.

SYMPOSIUM HONORS MIKE SHULER

Michael Shuler, the Samuel B. Eckert Professor of Engineering Emeritus, with his former students who attended a symposium honoring his career.

BUILDING A SCHOOL

At the same time he was pioneering an entirely new area of bioengineering, Shuler was also hard at work laying the foundation for what would one day become a new school at Cornell.

Since his first days at the university, Shuler was a strong advocate for integrating the life sciences into engineering. He helped formalize the university's first bioengineering program in 1994 with an undergraduate bioengineering option and a Master of Engineering degree in bioengineering.

He served as director of what was then the School of Chemical Engineering from 1998 to 2002. And while elements of bioengineering had been a part of the school since the 1950s, Shuler is credited with growing its prominence, and led the effort to officially add the word "biomolecular" to the school title. The school stands today as the Robert Frederick Smith School of Chemical and Biomolecular Engineering.

During his time as school director, Shuler was also sowing the seeds for a new biomedical engineering department. He had served on an advisory board that founded the graduate field of biomedical engineering in 1997, spanning five colleges and 11 different departments. The board eventually pushed for a more centralized academic unit that could have a larger impact on the field, calling for a strategic plan to establish a department.

It wasn't until 2004 that biomedical engineering became a full-fledged department, of which Shuler became the founding chair, a role he would serve in for a decade.

"It wasn't just his vision, but it was also his perseverance and hard work," said Marjolein van der Meulen, who succeeded Shuler as the James M. and Marsha McCormick Director of Biomedical Engineering.

Van der Meulen said Shuler formed the department with a core set of values "and all the hires under Mike bought into that set of values. And that created a very shared experience and a unity that's really unique and strong."

At the time the department was founded, Cornell was competing with about 100 other newly established biomedical programs from across the country, according to Lance Collins, the Joseph Silbert Dean of Engineering.

"So it was incredible that Mike was able to attract a stellar faculty," said Collins, "and it was really the power of his personality that was so attractive to people who were under consideration."

Shuler characterized the challenge of building a faculty from scratch more as a luxury, and said it gave him the opportunity to hire individuals with complimentary skills.

"You have to think about, when you're hiring faculty, building a team that will do something intellectually interesting. The intellectual parts have to mesh together," said Shuler, who added that teaching, research, service to the department and service to engineering are all important elements a faculty must possess.

Shuler created the momentum upon which van der Meulen could continue to grow the department, said Collins, and in 2015, the department became the Nancy E. and Peter C. Meinig School of Biomedical Engineering, adding an undergraduate degree to its curriculum.

"Just to put this into context," said Collins, "the first named department in the college is the Sibley School that was named in 1885, so it had been well over 100 years since that had happened."

In less than 15 years, biomedical engineering at Cornell had grown from a vision to a nationally-ranked school. *U.S. News & World Report*'s 2018 graduate school ranking places the Meinig School at number 14 in the country.

SHULER THE MENTOR

When Shuler was an undergraduate at the University of Notre Dame, he was confronted by a faculty member who told him he was underperforming.

"He really encouraged me in the sense that I could do much better," said Shuler. "And I did do much better after that—one of the things that was great about somebody encouraging me to believe in myself. And that's one of the things I've tried to do with the students I work with."

The symposium's keynote speaker, George Georgiou, M.S. '83, Ph.D. '87, shared a similar story. As a professor of chemical engineering and the Laura Jennings Turner Chair in Engineering at the University of Texas at Austin, Georgiou is an award-winning researcher lauded for his advances in protein therapeutics. But as Shuler's Ph.D. student preparing to graduate from Cornell, he struggled with confidence and felt his grades weren't as competitive as they could have been.

Michael Shuler, the Samuel B. Eckert Professor of Engineering Emeritus, speaks with his former students following a symposium honoring his career.

Shuler convinced Georgiou to apply for a faculty position at the University of Texas at Austin, and Georgiou credits getting the job to a recommendation letter from Shuler that touted his potential.

Georgiou shared a second recommendation from Shuler—a nomination letter for a National Science Foundation Presidential Young Investigator Award—that would boost Georgiou's career once again.

"It said I 'will do something important,'" said Georgiou, reading from the letter. "And that's what set me to the right course for my career."

Georgiou said he learned many lessons from Shuler, including "to believe in your students and to go through great lengths to support them. Mentoring is a great privilege and responsibility."

Mariajose Castellanos, Ph.D. '05, senior lecturer and undergraduate program director at the University of Maryland, Baltimore County, was another former student of Shuler's who spoke highly of his ability to mentor.

"Mike has really inspired me to make a difference in people," said Castellanos. "And so I think 'what can I do today to change someone's life?'"

She said Shuler taught her to develop students not just as engineers, but as human beings, and that many of the traditions she has created for her students are modeled after the ones she experienced at Cornell.

Many of Shuler's colleagues, too, benefited from his mentorship and advice. When the College of Engineering began searching for a new dean in 2008, Shuler's name was among those being considered, according to Collins, who was director of the Sibley School of Mechanical and Aerospace Engineering at the time. But Shuler contacted Collins and encouraged him to consider the job.

"It's not something I planned," said Collins, "but in that sort of quiet way we had an important conversation which, in some sense, built some of the confidence I would need in order to step into that role. And it's really incredible looking back on that, how important that was."

WORK TO BE DONE, FISH TO BE CAUGHT

Although he has received emeritus status, Shuler plans to maintain a small research group for at least the next four years to continue two funded research projects. He will also remain active in commercializing his body-on-a-chip technology as president and CEO of the startup company Hesperos, Inc.

Other than research, Shuler plans to dedicate more time to his favorite pastime, fishing, and hopes to write a science fiction novel. But above all, he said he looks forward most to spending more time with family.

"You need to be able to balance your family and work, especially if you're going to do this for 30, 40, 50 years," said Shuler. "I occasionally see people that are so focused on trying to be successful they lack this other aspect of life."

While those that know him best said they don't expect to see Shuler as much on campus, they do look forward to having him remain in one role he has always cherished—as a beloved professional advice giver.

ALUMNI NEWS

Noreen Rizvi '09 research on ACS Chemical Biology cover

Research by Noreen Rizvi '09 was featured on the cover of the March 2018 edition of *ACS Chemical Biology*. She conducted the study "Discovery of Selective RNA-Binding Small Molecules by Affinity-Selection Mass Spectrometry" as a postdoctoral fellow at Merck, but recently accepted a position as a senior scientist at Siemens Healthineers where she is working on developing diagnostic assays for healthcare applications across various disease areas.

Rizvi writes, "I had a truly rewarding experience learning about the pharmaceutical industry and drug discovery research. My research, focused on targeting RNA with small-molecule drugs, is still a developing field and it was great to be working on such a cutting-edge project."

Iyore Olaye '16 makes Forbes 30 Under 30

Iyore Olaye '16 earned a spot of the 2018 *Forbes* 30 Under 30 list in the category of Retail and Ecommerce. She was recognized for her role as the lead product development engineer at Walker and Company, a tech company that "makes health and beauty simple for people of color," according to its website.

Olaye stated that her experience with the Kessler Fellows Program helped her combine entrepreneurship with engineering, and allowed her to work over the summer with Walker and Company instead of a traditional engineering internship.

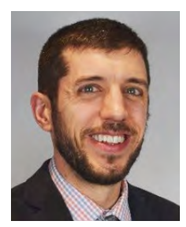
Hoang Phong Nguyen '18 makes Forbes Vietnam 30 Under 30

Hoang Phong Nguyen '18 was named to *Forbes* Vietnam's 30 Under 30 list for achievements in education. Nguyen is the youngest on the list this year. His Facebook page and YouTube channel, Love of Knowledge, produces original content, teaching foundational knowledge in various fields and has attracted thousands of viewers.

Brian Pfleger '00 wins ACS BIOT Young Investigator Award

Brian Pfleger '00, professor of engineering at the University of Wisconsin-Madison, won the American Chemical Society's Division of Biochemical Technology Young Investigator Award. The award honors an outstanding young contributor to the field of biochemical technology. Pfleger was recognized for his work in developing synthetic biology tools and deploying them in microbes to implement metabolic engineering strategies for sustainable chemical production.

Pfleger's research focuses on methods to close the carbon cycle by making chemical products from renewable resources, such as biomass, and by harnessing solar energy to power the conversion of carbon dioxide to chemicals. One example is the genetic engineering of cyanobacteria, some of the oldest organisms on earth, to create fuels and chemicals directly through photosynthesis without the need for agricultural land or potable water.



Lucas Landherr, Ph.D. '10 advises PBS series

Lucas Landherr, Ph.D. '10 and associate professor at Northeastern University, has been serving as an engineering consultant on the PBS YouTube series "Crash Course," helping to guide the creation of short animated videos on a number of topics such as thermodynamics and batteries. The work, along with other educational materials Landherr has produced, has earned him a Chemical Engineering Education Award from the American Institute of Chemical Engineers.

IN MEMORIAM

Karlton J. Hickey	B.S. ChemE 1944	Broomall, PA	2/8/2018
Edwin M. Sampson	B.S. ChemE 1944	Aiken, SC	2/22/2017
Park Lincoln Metzger	B.S. ChemE 1945	Orchard Park, NY	6/11/2017
William A. Sklarz	B.S. ChemE 1946	Edison, NJ	11/15/2017
Edwin N. Lightfoot	B.S. ChemE 1947, PhD ChemE 1951	Madison, WI	10/2/2017
John Cordes	B.S. ChemE 1949	Glens Falls, NY	7/20/2017
James L. Hecht	B.S. ChemE 1949	Littleton, CO	4/27/2018
Donald C. Roberson	B.S. ChemE 1949	Niagara Falls, NY	4/1/2017
Jacques L. Zakin	B.S. ChemE 1949	Dublin, OH	1/16/2018
Elmer K. Erickson	B.S. ChemE 1950	Wilmington, DE	4/23/2018
William J. Schwarz	B.S. ChemE 1950	Poughkeepsie, NY	9/12/2017
Carl G. Strub	B.S. ChemE 1950	Willow Street, PA	7/17/2017
Robert J. McLachlan	B.S. ChemE 1951	Martinsville, VA	7/11/2017
Alfred J. Engel	B.S. ChemE 1952	State College, PA	10/28/2017
Norman B. Schmidt	B.S. ChemE 1959	Leesport, PA	4/2/2018
Samuel W. Bodman	B.S. ChemE 1961	El Paso, TX	9/7/2018
Keith Allan Everett	B.S. ChemE 1961	Spring, TX	12/13/2017
J. Montieth Estes	B.S. ChemE 1966, M.Eng. 1966	Rochester, NY	2/11/2018
David S. Hubbard	B.S. ChemE 1966, M.S. ChemE 1968	Napier, NZ	2/7/2017
William J. Marble	B.S. ChemE 1966	Rocklin, CA	3/20/17
Natalie A. Dick	M.S. ChemE 1983	Ithaca, NY	2/5/2017

DISTINGUISHED LECTURES


Lisa Skeete Tatum '89

THE 2017 RAYMOND G. THORPE LECTURE WAS PRESENTED BY LISA SKEETE TATUM '89 ON MONDAY, OCTOBER 23

Skeete Tatum is founder and CEO of Landit, a technology platform created to increase the success and engagement of women in the workplace, and to enable enterprises to attract, develop and retain high-potential diverse talent. Landit provides each woman with a personalized playbook that empowers them with the tools, resources, know-how and human connections they need to more successfully navigate their career path.

Previously, Tatum was a general partner for over a decade with Cardinal Partners, a $350 million early-stage healthcare venture capital firm, where she focused on investments in healthcare technology and led the firm's investment in companies such as AthenaHealth and TechRx. She worked for Procter & Gamble in various global and functional roles including product development, purchasing and product supply. She also worked at GE Capital, was a managing director at health-beauty startup Circle of Beauty, and founded her own consulting practice specializing in medium-sized consumer product companies.

Skeete Tatum serves on the boards of Surgical Care Affiliates, McCarter Theater and the Princeton Area Community Foundation. She is a trustee emeritus and presidential councilor at Cornell University and serves on the Harvard Business School Board of Dean's Advisors. She is a past president of the Harvard Business School Alumni Board and former board member of Pager, the Kauffman Fellows Program's Center for Venture Education and the Princeton HealthCare System Foundation.

Skeete Tatum received her B.S. in chemical engineering from Cornell University and her MBA from Harvard Business School. She is a member of the Kauffman Fellows Class 4, a 2012 Henry Crown Fellow of the Aspen Institute and a member of the Aspen Global Leadership Network.

She has been featured in the Wall Street Journal, Forbes, Fortune, BBC Business and named one of the Most Impressive Women Entrepreneurs of 2016 by Inc. Magazine, and Landit was named one of the Top 10 Innovations That Made Women's Lives Better In 2016 by Fast Company.

THE 2018 JULIAN C. SMITH LECTURES WERE PRESENTED BY YUEH-LIN (LYNN) LOO ON MONDAY, APRIL 9, AND TUESDAY, APRIL 10

Faculty, students and colleagues from across campus gathered to hear her talks titled, "A Framework for Screening the Kinetic Stability of Packing Polymorphs" and "Making Smart Windows Smarter."

Loo is the Theodora D. '78 & William H. Walton III '74 Professor in Engineering and director of the Andlinger Center for Energy and the Environment at Princeton University. The mission of the Andlinger Center is to develop solutions for our energy and environmental future.

Loo received her B.S. from the University of Pennsylvania and her Ph.D. from Princeton University. She spent a year at Bell Laboratories before joining the Chemical Engineering Department at the University of Texas at Austin and then returning to Princeton in 2007. She is a fellow of the American Physical Society and a Young Global Leader of the World Economic Forum. She has been recognized with Sloan and Beckman Fellowships, the John H. Dillon Medal from the American Physical Society, the Peter and Edith O'Donnell Award from the Texas Academy of Medicine, Science and Engineering, and the Alan P. Colburn Award from the American Institute of Chemical Engineers.


Yueh-Lin (Lynn) Loo (left) with Professor Abe Stroock

REUNION 2018

On June 9, 2018, classes from years ending in 8 and 3 gathered on campus for Cornell Reunion. In keeping with tradition, the Robert Frederick Smith School of Chemical and Biomolecular Engineering hosted close to 120 alumni for breakfast in the Fred H. Rhodes Lounge. Members of classes from 1943 to 2013 shared memories of beloved faculty, fun times with classmates, and learned what's new in the school.

William C. Hooey Director, Abe Stroock, welcomed one the largest-ever groups of returning alumni. CBE faculty—including T. Michael Duncan, Al Center '65, Jim Engstrom, Chris Alabi, Lynden Archer and Matt Paszek—were present to welcome honored returnees and gave alumni a tour of the newly-renovated Unit Operations Laboratory. Visitors were also welcome to join the inaugural Ph.D. Reunion, happening in Olin Hall for the first time in 2018.

CBE GRADUATE ALUMNI REUNION

The inaugural Graduate Alumni Reunion was held on June 9, 2018, and was an opportunity for all CBE graduate alumni to return to Cornell and reconnect with their M.S. or Ph.D. adviser and other alumni. The event included Outstanding Alumnus Award presentations, given to Padmasree Warrior, M.S. '84, and Lydia Contreras, Ph.D. '08. Current graduate students enjoyed an alumni career panel, and alumni were excited to receive lab tours and see how Olin Hall has evolved since their time there. The reunion finished with a reception and dinner, where alumni mingled with current students and learned about other initiatives in the department.

The CBE Graduate Alumni Reunion was proposed, organized, and executed entirely by current CBE graduate students, and supported by the department as a Robert Frederick Smith initiative. The objectives of the reunion were to celebrate the achievements of CBE graduate alumni, to strengthen the alumni relationship with the Smith School and to provide current graduate students with networking opportunities.

CHEME VEGAS NIGHT: A 25-YEAR TRADITION

Vegas Night 2018

ChemE capstone laboratory and design courses simulate the professional world in which seniors serve as entry-level engineers at a fictitious company, Olin Engineering. The courses culminate in what has become a 25-year tradition—a casino-themed office party known as ChemE Vegas Night.

"No Ivy League education is complete without knowing how to play craps well," quips Professor T. Michael Duncan, who hosts Vegas Night with his wife, Deborah.

The party gives students an opportunity to practice the fine points of blackjack, such as when to split pairs and when to double-down on soft hands, and also offers roulette, let it ride, baccarat and poker. No actual money is wagered, but guests are given $1,000 in fictional cash, which they attempt to increase by playing various table games.

The incentive for winning is the evening's climax, an auction of "fabulous prizes," including memorabilia from the school and outings hosted by ChemE faculty. Past outings include an afternoon of golf (Ken Ackley), High Tea (Paulette Clancy), Sunday brunch at home (David Putnam), lifelong advice (Al Center), a Big Lebowski evening—white Russians and bowling (Tobias Hanrath), Caribbean dinner (Lynden and Shivaun Archer), an authentic Texas barbecue followed by a night of Texas hold 'em (Susan Daniel), dinner at Ithaca's historic Rogues' Harbor (Carol Casler), and dinner at the John Thomas Steakhouse (Abe Stroock).

The longest and most diverse list of prizes comes from Brad Anton, associate professor. From 1996 through 2004, Anton, a driving instructor at Watkins Glen International, gave rides around the speedway in his 1990 IROC-Z Camaro. From 2005 through 2010, his prize was an afternoon that came to be known as "Shooting with Anton," in which he instructed seniors on marksmanship and gun safety with his arsenal, including an antique M1 Garand. In 2011, Anton began hosting dinner for winning teams at the

"NO IVY LEAGUE EDUCATION IS COMPLETE WITHOUT KNOWING HOW TO PLAY CRAPS WELL."

—T. Michael Duncan

Photo by Adrienne Scott '15

VEGAS NIGHT

Grad student dealers Lakshmi Nathan, Ty Moeller and Hugh Bullen at Vegas Night 2018.

Alumnus dealer Stwart Pena '17 at Vegas Night 2018.

historic Seneca Lodge in Watkins Glen, New York.

Since 2016, Anton has offered a local tradition: dinner and a trivia contest at Trumansburg's Atlas Bowl. His Cornell team has yet to win, but came close this year with the seniors Josef Byrne, Chuting Deng, Allison Pereira, José Covarrubias, and Will Woodruff.

Anton reports: "We jumped to a strong lead and appeared to have it in the bag after round three, but were caught from behind in round four by a seasoned team of ringers from Trumansburg. The score stood 22-22 after regulation ended at round five, which necessitated a 'bowl-off' to break the tie. The bowl-off tiebreaker has one person from each team bowling one frame with no warm-up and the highest pin-count wins. Allison Pereira, who learned to bowl as a freshman in a phys-ed course at Helen Newman, volunteered to take the challenge. She rolled a strong 8, but so did the opponent, who was clearly a real bowler. So, it was on to double-overtime. The pressure was incredible. Alas, Allison's next two rolls found the gutter, so we were toast. Still, best-ever Quiz Bowl finish by a CBE trivia team."

Atlas Bowl Dinner and Trivia Contest team from May 2017. From left: Maria Blechl '17, Aron Coraor '17, Associate Professor Brad Anton, Kyle Wheeler '17 and Amy Penick '17.

Auctioneer Vinnie Rigoglioso '18 at Vegas Night 2018

As coveted as the faculty-hosted outings is the distinction of Best Gambler, which also goes to the highest bidder. This distinguished list has been remarkably prophetic of risk assessment and business acumen:

1996 - Darin Moberg
1997 - Susan Lee
1998 - Robert Cameron
1999 - Tara Flegel
2000 - Tom Richards
2001 - Stephen Bernal
2002 - Benjamin Davis
2003 - Emily Miles
2004 - Jason Berman
2005 - Matt McCord
2006 - Ugochi Nwachukwu
2007 - Shawn Zadeh
2008 - Ali Ahmed
2009 - Michael Myers
2010 - Lyudmila (Lucy) Baranyuk
2011 - Breanna Boyden
2012 - Douglas Greer
2013 - Christopher Trosin
2014 - Vikram Potdar
2015 - Ryan Douma
2016 - Matt Ferguson
2017 - Oliver Lake
2018 - Neil Mehta

Of course, the success of the auction depends on creativity in planning and enthusiasm in hawking. Unlike other auctions, the goal is entertainment and not revenue. The list of auctioneers, too, sets apart seniors with people skills:

1996 - Marty Palma ('96)
1997 - Jeff ('97) and Heather Pelham
1998 - Scott Meyers ('98) and Cindy Jarom ('98)
1999 - Robert Penty ('99) and Ory Holtzman ('99) (organizers), and Sean Holleran ('99), John Murphy ('99), and Julie Goddard ('99) (auctioneers)
2000 - Tom Richards ('00) and Merle Smith ('00)
2001 - Colleen Brosnan ('01) and Dina Agrapides ('01)
2002 - Chris Johnson ('02) and Tara Gooen ('02)
2003 - Tracy Ellspermann ('03) and Elizabeth Hastings ('03)
2004 - Matt Rizk ('04) and Michelle Barnas ('04)
2005 - Samantha Neureuther ('05) and Andrew Cooley ('05)
2006 - Matt Nitzberg ('06), Christina Jackson ('06), and Fatimah Aslam ('06)
2007 - Steve Hohwald and Nithya Jesuraj
2008 - Rachael Barton ('08) and Ariel Waitz ('08) (organizers), Jenny Dionne ('08) and Jamie Ambrosio ('08) (auctioneers)
2009 - Brian Weitzner ('09), Jason Reck ('09), and Rachel Brenc ('09)
2010 - Elyse Burzynski ('10) and Andrew Atwell ('10), assisted by Adrian Rami ('10) and Brandon Steckel ('10)
2011 - Christine Catudal ('11), Elizabeth Tutunjian ('11), and Colin Buss ('11)
2012 - Max Krakauer ('12), Katie Reilly ('12), and Kerianne Dobosz ('12)
2013 - Kevin Vasquez ('13) and Apurva Sisodia ('13), assisted by Tian Tian ('13) and Kerianne Dobosz ('12)
2014 - Franklin Lee ('14) and Allan Brooks ('14), with Ryan Hoang ('14) as counter.
2015 - Jeff Horner ('15) and Ian McQueary ('15), prizes collected by Heather Barton ('15) and Carl Shultz ('15)
2016 - Chida Balaji ('13) and Andrew Broenen ('13) with Will Gregg ('16) as counter, prizes organized by Will Gregg ('16), Eric McShane ('16), and Sanjeev Dhara ('16)
2017 - Allee Vito ('17) and Mohyeddine Algui ('17) with Will Gregg ('16) as counter.
2018 - Kathryn Haldeman ('18), Michaela Jones ('18), Vinnie Rigoglioso ('18), Ameer Basrai ('18), and Angela Tang ('18)

Each year a dedicated and skilled cadre of graduate students volunteers to serve as croupiers. Over 170 Ph.D. students have donated their time over the past 25 years.

ARCHER HEADS CORNELL ENERGY SYSTEMS INSTITUTE


Lynden Archer

The Cornell Energy Systems Institute, formerly named the Cornell Energy Institute, has a new director and a new focus as one of the university's main hubs for energy research and education.

Lynden Archer will serve a five-year term as the institute's David Croll Director, succeeding Jefferson Tester, who is now the chief scientist for Cornell's Earth Source Heat project. Archer is a professor and the former director of the Smith School of Chemical and Biomolecular Engineering, where he has researched transport processes for energy storage and carbon-capture technologies since 2000.

"He's one of the leading researchers in the area of energy, so Lynden brings great credibility in his ability to lead by example," said Lance Collins, the Joseph Silbert Dean of Engineering. "He's also an extraordinarily strategic thinker and an incredible fundraiser."

In recognition for his work on lithium batteries and nanoscale organic hybrid materials, Archer was elected to the National Academy of Engineering in 2018. These contributions also earned him a spot on the "World's Most Influential Scientific Minds" list compiled by Thompson Reuters in 2015 and 2016. Archer's demonstration of an electrochemical cell capable of sequestering carbon from the atmosphere and turning it into electricity was named one of the "10 Ideas That Will Change the World" by *Scientific American* in 2016.

The Energy Systems Institute is run by the College of Engineering, but organizes energy engineering-based research and education programs with university-wide impacts. While it will remain focused on the challenge of reducing carbon emissions without lowering quality of life, Archer said under his leadership the institute will more narrowly focus on enabling innovations in materials, technology and energy systems designs for impacts in transportation, manufacturing and the electric power systems which account for approximately 80 percent of annual carbon-dioxide emissions in the United States.

In transportation, the institute will seed research focused on advanced batteries, fuel cells and associated power-management systems aimed at making electrified transportation smart, cost-effective and commonplace.

In collaboration with the College of Engineering, the institute will identify and recruit faculty research stars to Cornell with a second specific purpose: to make manufacturing, buildings and energy operations management systems data-driven, dynamic components of electric power networks.

Through cross-college collaborations, the institute will build Cornell expertise, including in agriculture and chemical synthesis, for converting carbon dioxide emissions to useful products such as biofuels and plastics that can compete in the marketplace.

A strategic planning group commissioned by Collins added the term "systems" to the institute's name to reflect the importance of developing technologies as components of larger entities. As an example of the systems challenges posed by a new technology, Archer points to a transportation report finding electric cars in India have a worse carbon footprint than gasoline cars.

"HE'S ONE OF THE LEADING RESEARCHERS IN THE AREA OF ENERGY, SO LYNDEN BRINGS GREAT CREDIBILITY IN HIS ABILITY TO LEAD BY EXAMPLE. HE'S ALSO AN EXTRAORDINARILY STRATEGIC THINKER AND AN INCREDIBLE FUNDRAISER."

—Lance Collins

CORNELL ENERGY SYSTEMS INSTITUTE

"The electricity stored in the batteries that power even the most state-of-the-art electric car ultimately comes from the electric grid," Archer said. "If the grid is burning relatively low-quality coal, it generates quite a bit more CO2 to produce that electricity. So one has to think of new transportation technologies as part of a greater system to assess their full impact."

With a sharpened focus on three research themes, the institute also expects to play a stronger role in commercializing technologies developed at Cornell. There aren't many U.S. companies investing heavily in emerging technologies such as carbon-capture and batteries and as a result, researchers must bear more of the responsibility for bringing their ideas to market, according to Collins.

"We're on the frontier, developing new materials and technologies that may not come to fruition for another 30 years," said Collins, "but we're also looking at full implementation of demonstration systems that can change the energy landscape tomorrow. And that's where entrepreneurship plays a role."

Cornell's "living laboratory" philosophy, in which new technologies can be tested and deployed on campus, will continue to be a key element of the institute. Archer points to Cornell's Lake Source Cooling and Earth Source Heat projects as examples where Cornell is already leading the way.

"There's an opportunity to bring student teams together that go beyond just doing world-class research, writing patents and winning national contests," Archer said, "to get to a place where our students begin to see that they too can, and must, play a role in lowering humanity's carbon footprint and at the same time train their creativity into making new products that can compete and succeed in the market."

NEW FACULTY: NICHOLAS ABBOTT


Nicholas Abbott

When Nicholas Abbott was finishing up his undergraduate chemical engineering degree at Adelaide University in Australia, he knew he wanted to go abroad for his graduate studies. “At that time,” says Abbott, “most of the graduate school paths for students from Australia went through England.” Abbott had a conversation with a professor who told him about a place called the Massachusetts Institute of Technology (MIT). “I had never heard of it,” says Abbott, “but it was the less conventional path and I was all for it.” Abbott applied to MIT and got accepted into a Ph.D. program in chemical engineering.

The only things he knew about MIT before he got there were what his professor had told him and what he was able to glean from the newsprint brochure the school sent him in the mail. “It had a picture of boats on the Charles River, and I thought ‘yeah, that looks nice.’ I was sure I would get my Ph.D. and then return to Australia five years later,” says Abbott—now more than 30 years later—from his office at Cornell’s Olin Hall.

In the summer of 2018 Abbott joined the faculty of the Robert Frederick Smith School of Chemical and Biomolecular Engineering at Cornell as a professor. In the interim, Abbott earned his doctorate, had a two-year postdoctoral research position in the chemistry lab of Harvard professor George Whitesides, and taught at both the University of California-Davis and the University of Wisconsin-Madison. At Madison, Abbott was department chair and director of the Wisconsin Materials Research and Engineering Center. He published dozens of papers and graduated more than 40 Ph.D. students.

When Abbott came to Cornell, 10 of his graduate students and postdocs moved to Ithaca with him in order to continue their work.

“The research we do crosses disciplines,” says Abbott. “We work with people from the life sciences, physics, chemistry—and Cornell has a history of strong cross-disciplinary work. It feels like a good fit for me. I really liked the hiring process; Cornell did not bring me here with a specific goal for my research. I am here to explore ideas and I truly don’t know what is going to pop up. I can’t predict or anticipate the best thing that will grow out of the research we do here.”

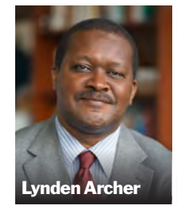
Abbott is looking to recruit more graduate students to his lab. His group has many ongoing projects. His technical interests revolve around colloidal and interfacial phenomena. He is particularly interested in colloidal forces in liquid crystalline phases. “We focus on soft materials,” says Abbott. “The challenge is to make a material that is the result of many weak, non-covalent interactions. We want to create materials that change properties when exposed to different environments. We work with liquid crystalline materials whose molecules are able to ‘communicate’ with each other across long distances—up to 100,000 molecules away in some cases.”

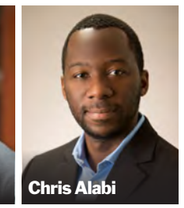
Abbott wants to use this communication ability to develop liquid crystals as chemical and biological sensors for a variety of purposes. “If we coat a surface with a layer of liquid crystals and then expose the surface to a target molecule, that exposure can perturb molecules on the sensor surface and those molecules will pass that perturbation on to their neighbors,” says Abbott. “At some point, the perturbation becomes visible and you can actually see that the target molecule is present.”

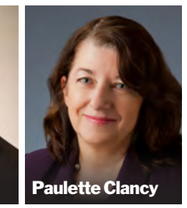
Abbott says that his time spent in the Whitesides Research Group at Harvard deeply affected how he works with graduate students. “George Whitesides is an amazingly creative and insightful individual. I learned so much as a postdoc—it was a terrific time for me. What I try to pass on to my students is a key idea of George’s: simplicity is good. And when something doesn’t go as expected in the lab, that tells you there is an opportunity to be followed.”

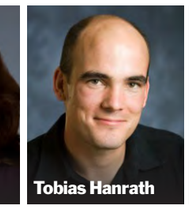
Abbott is excited to be at Cornell. “It is a new environment for me—a new adventure,” says Abbott. “There is something inspiring about being at a new place. It changes things and makes you feel like you have to show your value again.”

FACULTY NEWS & AWARDS


Lynden Archer


Chris Alabi


Paulette Clancy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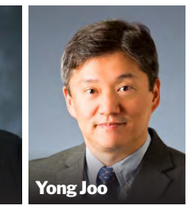
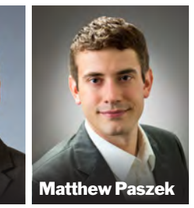
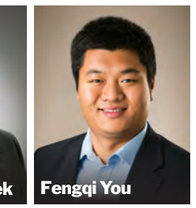

Yong Joo


Matthew Paszek


Fengqi You

Archer elected to National Academy of Engineers

Lynden Archer, the James A. Friend Family Distinguished Professor of Engineering, has been elected to the National Academy of Engineers—one of the highest professional distinctions accorded to an engineer.

Academy membership honors those who have made significant contributions to "the pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering, or developing/implementing innovative approaches to engineering education."

Archer was selected "for advances in nanoparticle-polymer hybrid materials and in electrochemical energy storage technologies," according to the academy. He will be formally inducted during a ceremony at the academy's annual meeting in Washington, D.C., on Sept. 30.

Chris Alabi, assistant professor and the Nancy and Peter Meinig Family Investigator in the Life Sciences, was selected as a 2018 Young Investigator by the American Chemical Society's Polymeric Materials: Science and Engineering Division, and was invited to present at the society's national meeting in August.

Paulette Clancy, the Samuel W. and M. Diane Bodman Professor of Chemistry, was approved for emerita status. She was also selected by the Graduate and Professional Student Assembly for an Outstanding Graduate Faculty/Mentor Award.

Tobias Hanrath, associate professor, along with David Erickson, the Sibley College Professor, and a team of students won the $20,000 grand prize in the NASA Tech Briefs Create the Future Design Contest for their entry, "HI-LIGHT - Solar Thermal Chemical Reactor Technology for Converting CO2 to Hydrocarbons."

Yong Joo, professor, was appointed the BP Amoco/H. Laurance Fuller Professor for a six-year term.

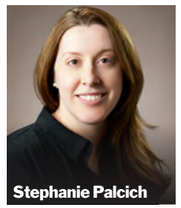
Matthew Paszek, assistant professor, received the honor of Tau Beta Pi Professor of the Year during the Cornell Engineering Alumni Association’s annual meeting and awards dinner.

Michael Shuler, the Samuel B. Eckert Professor of Engineering, has been approved for emeritus status.

Fengqi You, the Roxanne E. and Michael J. Zak Professor and David Croll Sesquicentennial Faculty Fellow, was selected to receive the 2018 CAST Outstanding Young Researcher Award from the American Institute of Chemical Engineers for his "contributions to fundamental theory and applications of supply chain optimization, sustainability analytics, energy systems engineering, integrated process operations, and data-driven decision-making." He was also elected a director of the Environmental Division of the American Institute of Chemical Engineers.

STAFF NEWS & HONORS

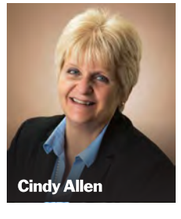
Stephanie Palcich receives outstanding staff award


Stephanie Palcich

Stephanie Palcich received the 2017 William C. Hooey Outstanding Staff Award. The award was established in 2011 by the Smith School to recognize a member of the staff who goes above and beyond their job responsibilities in helping the school and its faculty.

As the school's administrative assistant, Palcich manages the front office and the group of student workers who assist in the academic operation. She is the lead for tracking safety training completed by CBE students, supports the space committee and space inventory process, handles maintenance and repair requests, provides project support, completes department general purchases and assists in the onboarding of new faculty, staff and students.

Welcome Cindy Allen, director of administration


Cindy Allen

Lucinda M. (Cindy) Allen, joined CBE on Nov. 1, 2017. Cindy brings years of senior management experience from a retail business, an IT startup, a regulated utility and Cornell University. Allen earned her bachelor's degree from Rochester Institute of Technology (RIT) in information systems and organizational development. Her Master of Science degree, also conferred by RIT, was focused on service leadership and data analytics, with a thesis in measuring student experience in higher education. Allen looks forward to working collaboratively with the director, faculty, staff and alumni to foster CBE's success.

Special recognition: Sachiko Funaba

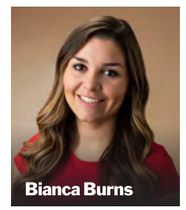
CBE has benefitted from the presence of Sachiko Funaba, who was hired in a temporary role as the director's assistant in September 2018 and has remained with the department in a temporary capacity to fill in for other staff vacancies. Funaba was responsible for organizing the fall 2017 Advisory Council Meeting, the Julian C. Smith Lectureship and candidate visits for faculty searches. Additionally, she supported the graduate student reunion weekend and commencement efforts.

This summer Funaba will be providing coverage as the director's assistant and is working with the Cornell Energy Systems Institute to plan the fall 2018 Energy Seminar.

Congratulations Sara Koyama Hwong and Shayna Barnes

CBE celebrated the graduation of two of its long-term student workers this year, Sara Koyama Hwong and Shayna Barnes. Hwong and Barnes, as well as CBE's other student workers, are an important part of the day-to-day support of the school and its instructional and research missions. We will miss seeing their helpful, happy faces and wish them well in all future endeavors.

Welcome Bianca Burns, graduate student services coordinator


Bianca Burns

Bianca Burns joined the Smith School this year as the graduate student services coordinator, just in time to welcome 82 new incoming graduate students. Burns comes from Provo, Utah, where she worked in elementary education. She was named the Teacher of the Year her first year of teaching due to her strong instruction and communication skills. Additionally, she has organized and led several large service projects. Burns has recently decided to leave classroom teaching and focus her skills in other aspects of education.

Welcome Mary Jane (Janey) Sager, CESI administrative manager

Sager joins the Cornell Energy Systems Institute (CESI) from Binghamton University where she was most recently the program staff associate for the NorthEast Center for Chemical Energy Storage (NECCES). In her four years with NECCES, Sager served as both the project and operations manager for the program. Prior to NECCES, she spent six years as a contract and grant administrator at the Research Foundation for SUNY Binghamton and is a certified pre- and post-award research administrator. She holds a Master of Public Administration (MPA) degree from Allegheny College.

FLEMING SCHOLAR AWARD

The Fleming Scholar award in the Robert Frederick Smith School of Chemical and Biomolecular Engineering was established in 2015 by a generous gift from alumnus Samuel C. Fleming '62 and his wife Nancy Fleming to recognize the very best graduate students working on biomolecular engineering research themes. The long-term goal of the Fleming Scholars program is to attract, educate and graduate Cornell Ph.D.s capable of leading their fields and of pioneering new areas of study that advance biomolecular engineering science.

Nominations for the award are solicited annually and come from a student's thesis advisor or from someone knowledgeable about the nominee's scholarship and potential. Although the Fleming Scholar recognition is bestowed annually, students receiving the award in any given year will hold the distinguished title for the duration of their Ph.D.

Jay Gandhi

Paszek and Koch Groups

Cancer aggression is typically accompanied by the presence of abundant polymers of sugars and proteins on the cell surface. These polymers form a coat called the glycocalyx. Gandhi uses computational and theoretical means to study the cancer glycocalyx and understand how cancer cells may be using this coat for their own good.

Particularly, Gandhi studies how cancer cells can use their dense glycocalyx to change their shape. He draws upon theoretical analyses of polymers attached to a surface to predict how cancer cells generate long tubes that they may use for communicating with other cells. He also uses computational approaches based on chemical transport and mechanics to understand the changes occurring in the glycocalyx when cancer cells reside in tightly packed tumors and when they metastasize through confined tissue spaces.

The changes Gandhi's simulations predict suggest cancer cells could use their confined environments to their advantage, due to indirect effects of the glycocalyx on chemical reaction pathways necessary for cell survival and growth. Gandhi hopes in the future this work can contribute to the development of cancer therapies targeting the abundant polymers in the glycocalyx, and particularly the physical functions of these molecules.

Yehou Michel Davy Gnopo

Putnam Group

Having grown up in Ivory Coast, an-ex French colony in Western Africa, Gnopo understands very well the importance of meeting the eight Millennium Development Goals defined by the United Nations. A lacking educational system, a failing healthcare and a stagnant economic landscape strongly reliant on foreign aid are issues he studied and lived daily. However, while Gnopo was unable to do much about these issues, except pursuing a more complete education beyond the Atlantic, he has been able to accumulate experience and tools to play a more crucial role in the efforts to implement the goals.

Gnopo's training at Cornell has exposed him to the inner workings of the vaccine and drug development and approval process. This knowledge and the work he has been conducting are quintessential for successful vaccination programs against infectious diseases. Effective vaccination programs are vital to economic development in developing countries who rely heavily on a healthy labor force.

Pathogen-like-particles (PLPs) are a promising vaccine delivery platform that can mimic pathogens and induce protective immune responses. Outer membrane vesicles, or OMVs, spherical lipid bilayers about 30-300 nm that naturally bud from the outer membrane of bacteria, are one example of PLPs. They display many pathogen-associated molecular patterns that mimic the composition and architecture of pathogens, making OMVs an excellent PLP vaccine adjuvant.

In addition to their adjuvant properties, OMVs can be engineered to display exogenous pathogenic proteins, making them a versatile vaccine delivery vehicle for a wide range of potential pathogens. For example, the Putnam Group previously engineered OMVs that effectively protected mice and ferrets from pandemic influenza infection. The focus of Gnopo's research is to investigate the colloidal stability of OMVs and expand the repertoire of pathogenic antigens that can be carried by OMVs to increase their utility to prevent infectious disease. Specifically, his research aims to recapitulate pathogen antigen composition through studying how to trigger fusion of OMVs to create hybrids that contain multiple antigens on a single vesicle.

GRADUATE NEWS

CHEGSA ANNUAL UPDATE

The Chemical Engineering Graduate Student Association (ChEGSA) is the primary organization for representing the graduate students and postdocs within the department. Over the past year, ChEGSA has made great strides in each of its priority areas to provide a more enjoyable graduate student experience in CBE.

Chemical Engineering Graduate Student Association

2018 update from ChEGSA leadership:

The main event in ChEGSA's professional development portfolio is the CBE Graduate Student Symposium. We expanded upon last year's program and had 15 speakers, including the first annual "best paper of the year" award and 28 poster presentations. We augmented the presentation evaluation method by including peer reviewed oral presentations and faculty reviewed poster presentations. We also highlighted this year's Smith Initiatives during the evening programming, giving the department a look into these student led initiatives. We have planned to expand our professional development efforts next year by including two new workshops such as storytelling, scientific graphic design or grant writing.

ChEGSA has always excelled at student events, and this year was no exception. Our group helped organize several traditional events including the Halloween costume mixer, Thanksgiving potluck, wine tasting mixer, and trivia mixer. However, we also tried out two new events, a chili bakeoff and a BBQ and beer tasting mixer, which had favourable feedback. Perhaps the most successful social events that began this year were the board game club and visit weekend board game mixer. The board game club meets bi-weekly and has an attendance of 20-30 people on average, garnering much interest. Additionally, the visit weekend board game mixer had approximately 75 attendees and was quite successful in aiding the recruiting efforts of the department.

The greatest strides were made in the area of promoting fellowship within the department. Under this umbrella, three main initiatives were pursued. The first was the added responsibility for recruiting. During visit weekend, ChEGSA not only paired prospective students with graduate student mentors, but we also helped organize the Saturday dinner to help the prospective students experience Ithaca. As mentioned before, the visit weekend was capped off with a successful board game mixer. To further add to this, after the acceptance deadline for the incoming students, they were immediately paired with new graduate students mentors to aid the incoming students with the transition to Cornell.

The second main initiative was promoting a healthy lifestyle through expanding our intramural sport program. This year our department took part in seven different sports, which we hope to maintain through next year.

The last, and perhaps most impactful initiative was beginning a mental wellness program that looks to improve the support system within our department to better manage stress, anxiety and depression. Currently, this is in its infancy, but we have constructed a survey for the department that we hope to use to better understand where we need to place our focus.

For our outreach we recently held an event with Habitat for Humanity where 15 volunteers helped with the construction of a house in Ithaca. The volunteers seemed to enjoy the work and we hope to continue these events once a semester going forward. As always, we helped raise significant donations during the Thanksgiving food drive and also took part in a spring product drive where we collected day-to-day products that low-income families cannot buy with food stamps.

Going forward, we have a good sense of the direction we would like to take as an organization. We recently posted an anonymous feedback form online for students to voice their concerns and comments about ChEGSA. We have a planned budget for our GPSA funds for next year and we are preparing to draft another budget for our departmental funds. Lastly, we plan to look at promoting the ethnical diversity in our department with new programming inclusive to international students such as an international potluck.

Overall, ChEGSA had a progressive year and we hope to continue with this momentum going forward.

2017-18 AUSTIN HOOEY GRADUATE RESEARCH EXCELLENCE RECONGNITION AWARD

The Austin Hooey Graduate Research Excellence Recognition Award is the highest award given to a graduate student by the Smith School of Chemical and Biomolecular Engineering. It recognizes outstanding contributions to scholarship and research towards a Ph.D., and engagement with the school's community. The award was established in 2005 by Professor Lynden Archer, then director of graduate studies, in honor of the late Austin O. Hooey (1922–2004). Her father, William Hooey, earned his degree in chemical engineering in 1912. Both deeply valued higher education and Cornell University.

To date, 27 CBE graduate students have been recognized with the award. The recipients from the fall 2017 and spring 2018 semesters are:

Yaset Acevedo

Clancy Research Group

Computational Characterization of Highly Selective Separation Processes using a Novel Covalent Organic Framework Woven Material

Advances in organic thin films and membranes have been developed for decades for catalysis, gas storage and separations. While nanofiltration and reverse osmosis are widely applied in separations at the nanoscale, there is an ongoing need to improve size and chemical selectivity in organic membranes. To address this need, we need a better understanding of the relationship between nanoscale structure and macroscale properties.

This is especially true for new materials. At the near-molecular-scale of some of the newest materials, understanding structure-property relationships is challenging for experimental techniques, but tailor-made for computational modeling and simulation. We model and assess the viability for a very new material, COF-505, a 3D covalent organic framework (COF) "weave" to selectively control gas adsorption and characterize its molecular scale morphology.

COF-505 is a unique member of the COF family. Unlike typical COFs, which have fairly rigid frameworks, COF-505 features an elastic material that consists of a weave of intertwined chains composed of bisphenanthroline and benzidine. Copper centers are present during fabrication of this material and these metal centers can be reversibly removed and re-added without loss of COF structure.

Demetalation is associated with a ten-fold increase in elasticity. Because of this unique property, we expect the interface between the organic weave and adsorbing gas molecules to be highly dependent on temperature and pressure, giving us two accessible and sensitive "levers" to tune to suit the requirements of a variety of applications. The woven composition of COF-505 endows the material with permanent porosity and is durable against fluctuations in temperature and pressure. Using Molecular Dynamics and Density Functional Theory, validated against experimental data, we explore the diffusion and adsorption properties of various gases in this unique material. In particular, we probe the capability of COF-505 to act as a responsive molecular sponge through the selective adsorption of gas molecules.

Mardochee Reveil

Clancy Research Group

Multiscale Modeling and Machine Learning Studies of the Diffusion of Silicon and Intrinsic Defects In III-V Semiconductors

Integrating III-V semiconductors into next-generation silicon-based processing is a promising alternative being considered as a route to faster and more energy-efficient electronic devices. To improve conductivity, these III-V materials will be doped, typically with Si. However, dopant activation remains an issue, compounded by the fact that there is still insufficient knowledge of the ease and preferred mechanistic pathways by which dopants, like Si, diffuse and become "activated" within the III-V matrix (i.e., they contribute to the desired improvement in electronic

properties). For example, an unusual increase in Si diffusion observed at high dopant concentration has for the most part remained unexplained.

Using Density Functional Theory (DFT) and Nudged Elastic Band (NEB) calculations, we have determined many of these critically important properties, namely, the energy barriers associated with the diffusion of both intrinsic point defects and extrinsic silicon impurities in prototypical III-V materials, here Zinc Blende structures for GaAs and InAs and the CuAuI-ordered ternary, In0.5Ga0.5As.

Refuting assumptions in the current literature that the experimentally observed enhanced diffusion can be attributed to an increase in Ga vacancies, vacancy-assisted diffusion of isolated Si atoms was found to be an unfavorable mechanism for this group of semiconductor alloys. Our results show that new and highly mobile species that are created at high dopant concentration are instead responsible for the enhanced diffusion observed at high dopant concentration. Those new species include Si complexes such as Si-Si pairs and Si split interstitials which can move more easily within the crystal lattice.

We use these DFT results to inform the development of a continuum model that addresses limitations in current models and shows close agreement with experimental results. We also develop a new method whereby machine learning, in lieu of DFT, is used to predict forces during NEB simulations. This new method allows us to compute transition pathways at a fraction of the cost, while maintaining reasonable accuracy compared to a traditional DFT approach.

Snehashis Choudhury

Archer Research Group

Rational Design of Nanoporous Polymer Electrolytes and Solid-Liquid Interphases for Lithium Metal Batteries

Advances in the basic science and engineering principles of electrochemical energy storage is imperative for significant progress in portable electronic devices. In this regard, metal-based batteries comprising of a reactive metal (like Li, Na, Al) as anode have attracted remarkable attention due to their promise of improving the anode-specific capacity by as much as 10-fold, compared to the current state-of-art Li-ion battery that uses a graphitic anode.

Perhaps their greatest advantage lies in the possibility of using a Li-free high-capacity cathode like oxygen, which can improve the gravimetric energy density of batteries from ~0.3kWh/kg to ~12kWh/kg (i.e. comparable to the useful energy available from combustion of hydrocarbons). However, a persistent challenge with batteries based on metallic anodes concerns their propensity to fail due to short-circuits produced by dendrite growth during battery recharge, as well as by runaway of the cell resistance due to internal side reactions with liquid electrolytes.

On the basis of a linear stability analysis of dendrite growth during metal electrodeposition, we have showed that the length-scale on which transport occurs near the electrodes can be as important as electrolyte modulus in stabilizing metals against dendrite formation. To evaluate this proposal, we designed cross-linked nanoparticle-polymer composite electrolytes with tunable pore size and quantified the stability of metal electrodeposition in these systems. Direct visualization of electrodeposition using these electrolytes showed remarkable agreement with the theoretical predictions. Furthermore, when operated in a battery, the crosslinked membrane demonstrated stable galvanostatic cycling of lithium metal anodes for several hundreds of hours.

Importantly, these studies showed that while the tendency for battery failure by dendrite-induced short-circuits can be reduced in polymer electrolytes, the issue of capacity-fading as a result of continuous reactions of the metal with liquid electrolyte persists. Through multiscale modeling of ion transport, artificial solid electrolyte interphase (SEI) designs will be proposed for lithium-oxygen batteries to enable stable recharge and low overpotentials even with chemically reactive liquid electrolytes.

UNDERGRADUATE PROFILES

Grace Chuang '18

WHY CORNELL?

This past year I was giving an individual tour to a prospective student and during the tour, we walked through the project team space in Upson Hall. The energy in the room was so high. There was music blasting, there were spare parts and objects everywhere and machines running, and people were running around, but everyone we bumped into was so excited to tell us about what they were working on. The tour was supposed to be just for the prospective student (and believe me, he left about ready to apply to Cornell right then and there), but it ended up also being for me, because I left falling in love with Cornell all over again. What I saw there sums up what I've experienced in my four years here—hands on work, energy and lifelong friendships.

LEADERSHIP POSITIONS HELD AT CORNELL:

I was the policy & practices subteam lead for Cornell iGEM, a synthetic biology project team. I also was an engineering ambassador, a graduate of the Engineering Leadership Program, a Frank and Rosa Rhodes Scholar and a Kessler Fellow, an entrepreneurial fellowship that funds engineers to work at a startup. I worked at a film agency! Finally, I'm a Rawlings Research Scholar too—through that, I worked in the Paszek Lab for two years and then moved over to working in the Sabin Design Lab.

MAJOR ACCOMPLISHMENTS AS A LEADER:

I co-founded Untold (untoldatcornell.com), an interactive event at the Johnson Museum of Art sharing the stories of 18 people in the Ithaca community through photographs and audio. My team of four other engineers and I, through the Engineering Leadership Program, worked for seven months to give a platform to the homeless, refugees, students and the elderly. On Nov. 18, 2016, we put our exhibit up and over 300 people walked through our doors. I will never forget the energy in the room, the feeling of watching strangers listen together, and faces of our interviewees when we delivered the notes that attendees had written back to them.

I have a huge passion for telling other people's stories, but on the other side, I am also proud of being a 2018 speaker for Soup & Hope, which is a biweekly series that highlights personal stories from the Cornell community. Six people are asked every spring semester to speak and this time around, I was given the opportunity to share my own story. You can listen to my talk here: bit.ly/2K1dHJT.

ADVICE FOR FUTURE STUDENT LEADERS:

Being a leader does not mean that you have to be the most extroverted or dominant person in the room. Everyone leads in different ways. Find out what makes you, you, and the strengths and gifts that you have been given. Then, figure out how to cultivate those strengths!

POST-GRADUATION GOALS:

I will be joining the Creative Team at Ginkgo Bioworks in Boston! I am so excited to continue exploring the interdisciplinary side of myself and continuing to bridge engineering and art.

FAVORITE OLIN HALL/CHEME MEMORY:

Hanging out with my senior product design group every week. I am thankful for groupmates who are friends outside of Olin Hall, too.

UNDERGRADUATE PROFILES

Emily Cheng '18

WHY CORNELL?

I was mostly applying to schools near my home in Tennessee when I heard about Cornell. At the time, I was looking for schools with renowned engineering programs, and Cornell certainly fit that description. Additionally, I sought a school that would allow me to interact with people from many different cultures and backgrounds. Because of timing and travel constraints, I actually matriculated to Cornell before I was able to visit. The risk that I took in deciding to attend without knowing much about Cornell turned out to be one of the best decisions of my life.

LEADERSHIP POSITIONS HELD AT CORNELL:

I am currently the musical director for my a cappella group, Less Than Three A Cappella. I have held a number of positions within that organization and have also been on the executive board the last three years for the Society of Women Engineers (SWE). Within SWE, I was the director of student services for two years and am one of the outgoing co-directors of conference. I am the most senior member of the Thompson research group and have been mentoring and training the new undergraduate and graduate students. During my time at Cornell, I was also a mentor for the CUEmpower Engineering Mentorship program, a piano teacher for the Cornell Piano Society and a volunteer for elementary STEM outreach.

MAJOR ACCOMPLISHMENTS AS A LEADER:

My a cappella group is one of the youngest groups on campus, and I am honored to have been a part of its tremendous growth over the last few years. As a group open to all who identify as women, genderqueer, and/or nonbinary, we are committed to advertising to diverse audiences that are LGBTQ+ and/or of all cultures and backgrounds. With the help of the other members of the executive board, I led the group to grow from performing for dozens of audiences to a few hundred every semester.

In SWE, I led several fantastic teams to grow our monthly general body attendance by over 200 percent. Since SWE is the largest engineering student organization, it was important to me to create more social opportunities for our members to build lasting friendships, invoke a sense of belonging, and mentor younger students. I also spearheaded the creation of a major team-building event that raised money for the American Association of University Women. Working with my various student organizations and my research group has given me the opportunity to gain experience leading both large and small groups, and I am looking forward to working with more teams in my future career.

ADVICE FOR FUTURE STUDENT LEADERS:

In my time here, I have found that the key to being an effective leader is knowing when to say no, how and when to delegate, and what the strengths and weaknesses of your members are. Every member of your team has the ability to contribute positively to your organization, and understanding how to help them find their place and feel included will not only bolster the effectiveness of your organization but also create stronger friendships. The most important lesson I have learned at Cornell is how to fail, and it has allowed me to understand myself so I can be both a better teammate and better leader to various organizations.

POST-GRADUATION GOALS:

I will be working at Apple this summer as a Materials Engineering Research & Development Product Engineering intern in the thin films department. I will be returning in the fall to complete my Masters of Engineering in materials engineering. I plan to work in the electronics/tech industry in the future after completing my masters. Additionally, I would like to work with more nonprofit organizations in the future to support women and underrepresented minorities in STEM fields. Outside of engineering, I produce music professionally and would love to expand my repertoire and client base in that field once I graduate.

FAVORITE OLIN HALL/CHEME MEMORY:

The CBE holiday party last semester was a lot of fun. It was great to see everyone dressed in their best party clothes and take a night off, and I enjoyed reminiscing with friends about how far we had come since sophomore year.

Sreejata "S.J." Munsi '18

WHY CORNELL?

I knew I wanted to be an engineer, but I didn't necessarily want to be surrounded by only engineers. Cornell, in addition to being a prestigious institution, is a place that has intelligent people with diverse interests and talents. And that, honestly, was what drew me to this university. The people.

LEADERSHIP POSITIONS HELD AT CORNELL:

I served as Class of 2018 president through Cornell University Class Councils during junior and senior years. During my time at Cornell, I was also a mentor for the CUEmpower Engineering Mentorship program, a piano teacher for the Cornell Piano Society and a volunteer for elementary STEM outreach.

MAJOR ACCOMPLISHMENTS AS A LEADER:

I have been involved in student government since my freshman year when I joined Cornell University Class Councils. We plan large school-wide events, such as Homecoming T-shirt giveaways, Movies on the Arts Quad, Convocation and Senior Days. Since my junior year, I began serving my class as the Class of 2018 president. I also spoke at Convocation and represented the Class of 2018 as I walked during Commencement as a Class Marshal. It has been an incredible honor to be in this role—without Class Councils, I would have never met some of my closest friends, or worked with other strong leaders on this campus. I planned events for 14,000 undergraduate students, which is something I find humbling.

ADVICE FOR FUTURE STUDENT LEADERS:

Class Councils has pushed me out of my comfort zone, and taught me so many skills about leadership. I learned how to problem solve and think on my feet, which I know is valuable to an engineer. My advice is to encourage all student leaders to try new things. Going out of your comfort zone will definitely make you a better and stronger leader. It won't be easy, but at the end of the experience, I guarantee it will be worth it.

POST-GRADUATION GOALS:

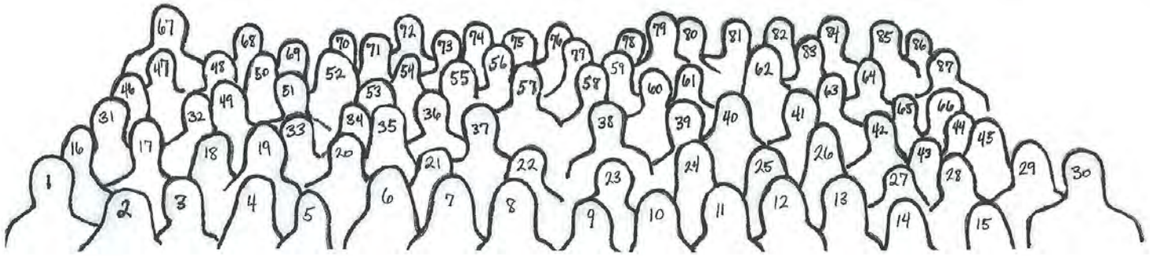
I will be a Beauty Research & Development Engineer at Procter & Gamble in Cincinnati, Ohio.

FAVORITE OLIN HALL/CHEME MEMORY:

My favorite memory at Olin Hall was handing out fun presents to my professors as Santa at the Holiday Party. A close second favorite memory are all the late nights in the Undergrad Lounge, which is when I really got to know other ChemEs on a more personal level.

Sreejata "S.J." Munsi '18 as Santa at the school holiday party.

CONGRATULATIONS TO THE CLASS OF 2018!



Class of 2018

1 Allen Jiang
2 Jane Liao
3 Justin Lin
4 Michaela Jones
5 Emily Cheng
6 Stephanie Yiu
7 Angela Tang
8 Chuting Deng
9 Allison Pereira
10 Alyssa Kirsch
11 Xin Ting Liao
12 Sophie Cong
13 Alexis Marquez
14 SJ Munsi
15 Morgan Parker
16 Gautham Sezhian
17 Drew Lepore
18 Courtney Bui
19 Kathryn Haldeman
20 Kayla Niccum
21 Jessie Reeves
22 Dwiju Hemanth
23 Monica Manickam
24 Erica Gardner
25 Fernanda Piorino
26 Shelby Head
27 Xiao Yin Ma
28 Esha Halabe
29 Amy Wey
30 Evan Wait
31 Ameer Basrai
32 Peter Romero
33 Lilly Mendoza
34 Karlie Mellott
35 Emily Zinnikas
36 Daniel Vasquez
37 Vinnie Rigoglioso
38 H. Phong (Phillip) Nguyen
39 T. Tung Le
40 Dale Shearin
41 Josh Calka
42 Amelia Sugianto
43 Sara Ng
44 Doris Chen
45 Jing Huang
46 Max Goldberg
47 Eitan Jaffe
48 Carolyn Schwartz
49 Pooja Maheshwari
50 Kitty Hennessy
51 Khloe Heath
52 Oge Anyene
53 Sanjana Sundaram
54 Grace Chuang
55 Auggie Longo
56 Joe Hassler
57 Adam Berry
58 Charles Jackan
59 Josef Byrne
60 José Covarrubias
61 Will Woodruff
62 Katie Conway
63 Rahul Rajagopalan
64 JD Gómez
65 Kiana Leung
66 Cynthia Fung
67 Theo Goosen Jr
68 Lee Puckett
69 Yerin (Erin) Kim
70 Alec Sung
71 Daniel DeCorla
72 Daniel Lorenzo
73 Mingyung Jiang
74 Matthew Crafton
75 James Bischoff
76 Ben Voss
77 Seth Feder
78 Elijah Martinez
79 Min Kim
80 Winston Lee
81 Akash Vaidya
82 Graham Richartz
83 Quinn McNeil
84 Max DeCataldo
85 Tim Tsang
86 Anna Kryczka
87 Andy Luke

Not pictured:
Helen Hultin
Juliet Kopel
Lauren Russo
Maharshi Thakker
Neil Mehta
Rebecca Herz
S. H. (Andrew) Hong
Wesley Campbell
YangJin (Michael) Yoon

STUDENT AWARDS & HONORS 2017-2018

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS OTHMER SOPHOMORE ACADEMIC EXCELLENCE AWARD

Angela Tang '18
This award was established by the AIChE to recognize undergraduate academic excellence. *Left to right: Professor Engstrom and Angela Tang.*

TAU BETA PI SCHOLARSHIP

Kayla Niccum '18
This award supports engineering students in their senior year recognizing their academic achievement, extracurricular activities, and the promise of substantial contributions to the engineering profession. *Left to right: Professor Paszek and Kayla Niccum.*

TAU BETA PI SCHOLARSHIP

Vincent Rigoglioso '18
This award supports engineering students in their senior year recognizing their academic achievement, extracurricular activities, and the promise of substantial contributions to the engineering profession. *Left to right: Professor Paszek and Vinnie Rigoglioso.*

SHELL TECHNICAL SCHOLARSHIP

Kayla Niccum '18
This award supports students pursuing an undergraduate degree in specific technical fields of study. *Left to right: Professor Stroock and Kayla Niccum.*

TAU BETA PI SCHOLARSHIP

Thanh Tung Le '18
This award supports engineering students in their senior year recognizing their academic achievement, extracurricular activities, and the promise of substantial contributions to the engineering profession. *Left to right: Professor Paszek and T. Tung Le.*

TAU BETA PI SCHOLARSHIP

Thanh Tung Le '18, Vincent Rigoglioso '18, Kayla Niccum '18
This award supports engineering students in their senior year recognizing their academic achievement, extracurricular activities, and the promise of substantial contributions to the engineering profession. *Left to right: Professor Paszek, Vinnie Rigoglioso, T. Tung Le and Kayla Niccum.*

UNDERGRADUATE AWARDS

GOLDWATER SCHOLARSHIP

Allen Jiang '18
Recognizing intellectual curiosity and excellence in mathematics and engineering. *Left to right: Professor Stroock and Allen Jiang.*

FRANK AND ROSA RHODES SCHOLARSHIP

Grace Chuang '18
Recognizing outstanding academic achievement and leadership. *Left to right: Professor Paszek and Grace Chuang.*

PHILLIPS 66 UNDERGRADUATE SCHOLARSHIP

Michaela Jones '18
Recognizing exceptional academic achievement with professional potential in the oil and energy industry. *Left to right: Professor Duncan and Michaela Jones.*

PHILLIPS 66 UNDERGRADUATE SCHOLARSHIP

Kathryn Haldeman '18
Recognizing exceptional academic achievement with professional potential in the oil and energy industry. *Left to right: Professor Olbricht and Kathryn Haldeman.*

PHILLIPS 66 UNDERGRADUATE SCHOLARSHIP

Emily Cheng '18
Recognizing exceptional academic achievement with professional potential in the oil and energy industry. *Left to right: Professor Mike Thompson, Associate Dean for Undergraduate Programs and Emily Cheng.*

GENENTECH AND GEORGE SCHEELE OUTSTANDING JUNIOR AWARD

Allen Jiang '18
This award is sponsored by Genentech in memory of Professor George F. Scheele, former associate director of the school, to recognize academic excellence, and achievement in campus and professional activities. *Left to right: Carol Scheel and Allen Jiang. Allen was recognized by Ariel Waitz '08 Senior Engineer, Genentech during the Career Perspectives lecture.*

SPHINX HEAD SENIOR HONOR SOCIETY INDUCTION

Peter Romero '18
The Society recognizes demonstrated respectable strength of character on top of a dedication to leadership and service at Cornell University. *Left to right: Professor Anton and Peter Romero.*

AWARD FOR OUTSTANDING SERVICE TO THE SCHOOL

Akash Vaidya '18
This award recognizes outstanding service to improve the professional and social culture of the school. *Left to right: Professor Stroock and Akash Vaidya.*

AWARD FOR OUTSTANDING SERVICE TO THE SCHOOL

Joseph Hassler '18
This award recognizes outstanding service to improve the professional and social culture of the school. *Left to right: Professor Stroock and Joe Hassler.*

OUTSTANDING UNDERGRADUATE TEACHING ASSISTANT OF THE YEAR AWARD

Anderson Luke '18
Chosen by the faculty for outstanding teaching by an undergraduate assistant and his contributions to Mass & Energy Balances, and Analysis of Separation Processes. *Left to right: Andy Luke and Professor Duncan.*

OUTSTANDING UNDERGRADUATE TEACHING ASSISTANT OF THE YEAR AWARD

G. Benjamin Voss '18
Chosen by the faculty for outstanding teaching by an undergraduate assistant and his contributions to Process Control Strategies. *Left to right: Professor Center, Ben Voss and Professor Lomax.*

CHEMICAL ENGINEERING OUTSTANDING SCHOLAR AWARD

Shelby Head '18
This award recognizes outstanding scholarship, mastery of chemical engineering fundamentals, demonstrated application in the capstone laboratory and design courses and professional promise. *Left to right: Professor Paszek and Shelby Head.*

FERDINAND RODRIGUEZ OUTSTANDING STUDENT AWARD IN POLYMERS AND ELECTRONIC MATERIALS

Adam Berry '18
Honoring Professor Rodriguez and recognizing outstanding achievements in academics and in the professional community. *Left to right: Professor Joo and Adam Berry.*

OUTSTANDING CHEMICAL ENGINEERING UNDERGRADUATE RESEARCH AWARD

Allen Jiang '18
This award recognizes a demonstrated record of ability, indication of leadership, and professional promise. *Left to right: Professor Stroock and Allen Jiang.*

GIVING OPPORTUNITIES

The Smith School has outgrown Olin Hall, but we have plans to grow, from the inside, our venerable home to accommodate our programs into the future. Olin has been prioritized in the College of Engineering's Facilities Master Plan for a full renovation. This prioritization recognizes the exceptional growth that has occurred in the school, in teaching and research, over the past decade. To accommodate our current and future programs, the plan aims to liberate significant new space within Olin Hall—with a recovery of all the space occupied by college services—to accommodate state-of-the-art laboratories and teaching and common spaces. This re-envisioning and reinvigorating of Olin for its next 75 years brings exciting opportunities and funding priorities:

Creation of a Cornell Institute for Biological Design and Manufacturing

$1 - $10 million

Chemical engineers at Cornell are using the principles of biological and engineering design to harness living organisms for manufacturing chemical products. The Institute for Biological Design and Manufacturing will capitalize on this trend to catalyze progress towards a new 'biomanufacturing economy,' in which engineers develop biological systems to manufacture new products—materials, therapeutic drugs, and fuels—that address some of the world's most pressing problems. Gifts in support of the institute will allow the school to renovate and expand space in Olin Hall that will house the institute. Your support of the institute will also provide annual support for research and education programs related to the institute's mission.

Creation of the Heart of the Smith School in Olin Hall

$5 - $10 million

For the first time in the history of the school and of Olin Hall, we have an opportunity to create a true home-base for Chemical and Biological Engineering. One that celebrates our past (the Rhodes Lounge mural) and hosts dynamic interactions between students and faculty as they design our future. Olin Hall occupies an iconic space on Ho Plaza in the center of Cornell's campus. This new space within Olin will serve as the beating heart of this center, showcasing the creativity and hard work of the ChemE's of today and tomorrow.

Creation of next generation spaces for active learning and research

$100,000

Within the scope of our complete renovation, we have opportunities to invest in state-of-the-art facilities for interactive learning, student project space and research. With much of the building untouched since the cinderblocks were laid in 1942, we have spaces of all size and for our whole range of programs—from process and product design through to the discovery of advanced materials for energy storage—that need to be updated and renovated.

FACULTY

Professor of Practice

$3,000,000 Endowment

Industrial Practitioners (IPs) are chemical engineers with considerable practical experience who return to Cornell to serve as lecturers. Since the mid 1990's, CBE undergraduates have benefited greatly from continuous service of IPs in our capstone Chemical Process Design Course and Unit Operations Laboratory. More recently, IPs have played a central role in the development of new components of our curriculum in Product Design and Energy Economics.

Endowed Professorship Biomolecular Engineering

$3,000,000 Endowment

Gifts to this fund will support salary and research startup costs for hiring a member of the faculty who will facilitate growth of biomolecular engineering.

Faculty Start Up Funds – Faculty Renewal

$500,000 Current Use

Current use gifts to support the hiring of faculty in CBE.

GRADUATE FELLOWSHIPS

Graduate. Fellowships / Awards

- **Endowed.....$1.5 million endowment**
- **Term (5-year current use).....$300,000**
- **Graduate "Award"..... $100,000 endowment**

Attracting talented graduate students to the school is a key goal in our pursuit of excellence in research. Your gift will allow the school to meet its goal of providing competitive graduate fellowships to every first year graduate student enrolled in the chemical engineering program.

Teaching Immersion Fellowships for Doctoral Students

$1.5 million endowment

The goal of CBE's teaching immersion fellowships is to facilitate the development of doctoral students committed to careers in academia. Gifts in support of these fellowships will be used to fund graduate students who serve as TAs in multiple courses.

Professional Masters Fellowships

$1.5 million endowment

Graduate Award

$100,000 endowment

The school's Master of Engineering programs have never been larger or more vibrant than they are today. Students enroll from around the world to take on courses and projects within our four specializations: Computational Informatics, Energy Economics and Engineering, Medical and Industrial Biotechnology, and Product Design. This endowment will allow the school to provide these opportunities to talented young engineers who might otherwise not be able to afford the program.

PROGRAM SUPPORT

Startup funds for new student project teams

$50,000 or any size gift

Support CBE WOMEN (Women in Engineering

$50,000 or any size gift

Support industrial field experience and international opportunities for students

$100,000 endowment

Field experiences and international programs provide some of the richest possible training for students of the school. A summer experience at Imperial College London's carbon capture pilot plant and a week-long training in off-shore operations at a Shell facility have been made financially viable for cohorts of students over these past several years by generous gifts from alumni. We hope to continue these programs and expand opportunities in the coming years, in particular with visits to and engagement with companies in our region.

CBE Discretionary Fund

Gifts of Any Size

Unrestricted gifts of any amount may be directed to CBE and will provide the director the flexibility to support the priorities listed above, aggressively recruit and retain junior faculty, seize other opportunities and address challenges at their discretion.

FOR MORE INFORMATION ON THESE OR ANY OTHER GIVING OPPORTUNITIES, CONTACT

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https://www.cheme.cornell.edu/alumni/giving.cfm

Cornell Engineering

Robert Frederick Smith School of Chemical and Biomolecular Engineering