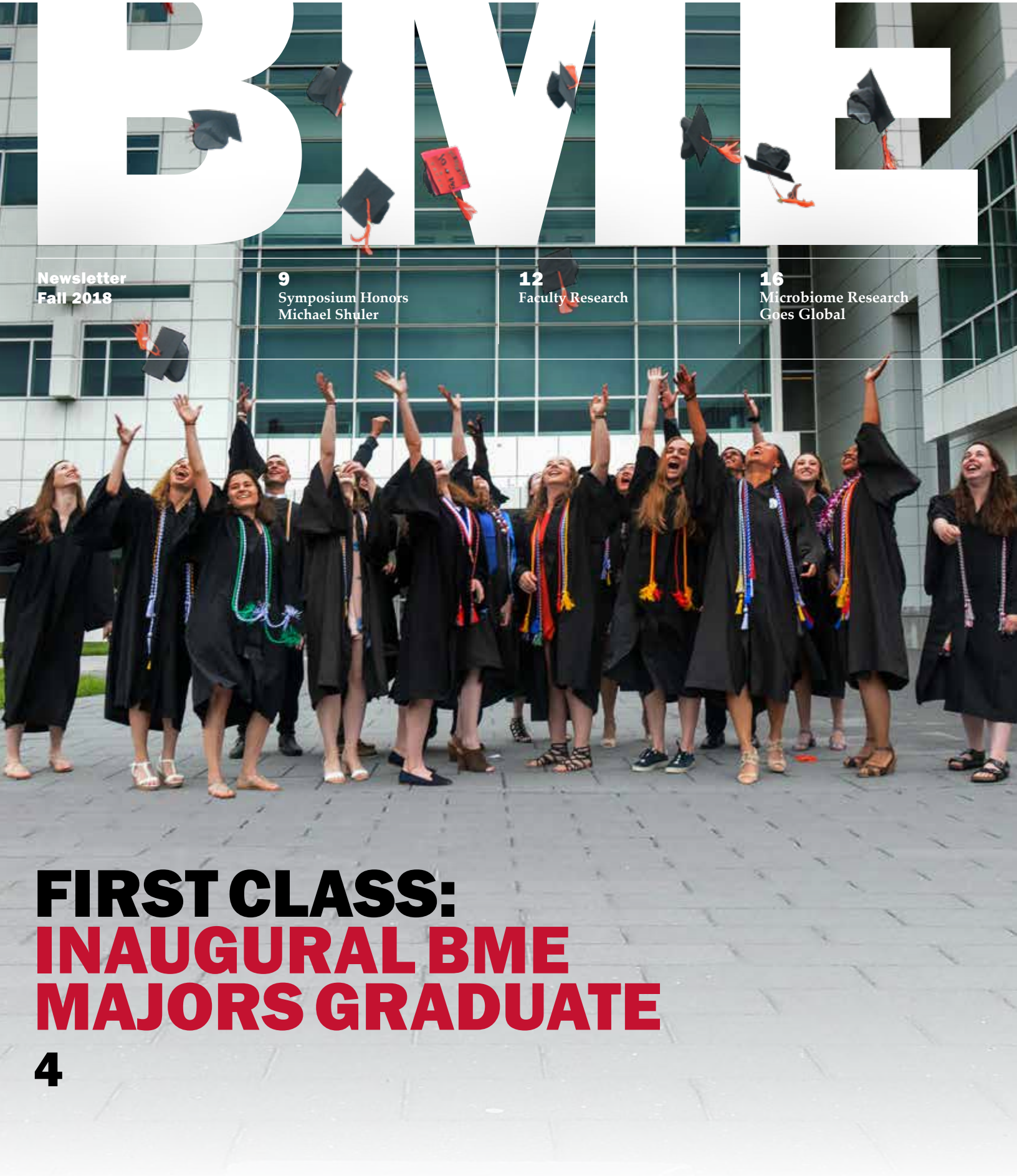
CornellEngineering
Nancy E. and Peter C. Meinig School of Biomedical Engineering

BME

Newsletter
Fall 2018



FIRST CLASS: INAUGURAL BME MAJORS GRADUATE

BME MESSAGE

MESSAGE FROM THE DIRECTOR: MARJOLEIN C.H. VAN DER MEULEN

Welcome to our 2018 biomedical engineering newsletter. We are happy to share our news from the 2017-18 academic year with you, starting with our cover story.

May 2018 marked the graduation of the first B.S. degree recipients in BME! We had been looking forward to this milestone since the biomedical engineering major first was approved by NY State in June 2015. We have enjoyed getting to know this wonderful group of 19 students. As you will see from their profiles (p. 7), their next steps include a lot of further study scattered around the country. I can't wait to hear about future successes from this special first class of graduates!

Overall the undergraduate major continues to grow, and I expect we're not at steady state yet. The College has reached a major milestone with gender parity, and BME continues to be exceptional with 80% female enrollment.

On the other end of the career spectrum, we are sad to have Mike Shuler retire but very grateful for his prolonged leadership and vision. Mike established and led biomedical engineering for the more than two decades that I have been at Cornell. Mike has been synonymous with Cornell BME and will be missed. We celebrated his career and enjoyed catching up with alumni from different eras in June (p. 9).

A year ago we lost Pete Meinig, who, along with his wife Nancy and their daughters, endowed our School. We are thankful for Pete's long service to his alma mater and honored to bear his name.

Our faculty continues to grow. Both McAdam Professors are fully moved and settled on campus. Yadong Wang arrived more than a year ago, and his laboratory is up and running in the newly renovated Kimball Hall. Jim Antaki joined us in January, and became fully resident in Weill Hall this summer. We are thrilled to have Yadong and Jim join us and look forward to the strengths they add in cardiac, biomaterials and device research. Jim will also bring ideas and energy to our senior design course. Our junior search yielded two fantastic new colleagues who will join us in the future (p. 21): Esak (Isaac) Lee, currently at the Wyss Institute at Harvard, and Nate Cira, currently at the Rowland Institute, also at Harvard.

As you will see, our students and faculty continue to do well and be recognized for their contributions. Larry Bonassar received an endowed chair, a recognition of his research program. Dave Putnam and Jonathan Butcher were promoted to Professor this year. Our junior faculty received several national awards including the NIH Director's New Innovator Award (Ilana Brito & Iwijn De Vlaminck), NIH Trailblazer Award (Steve Adie), NSF Career (Steve Adie & Mert Sabuncu), Packard Foundation Fellowship (Brito) and Pew Scholar (Brito). Iwijn De Vlaminck, Dave Putnam and Ankur Singh were recognized by the College for their outstanding teaching contributions. The full list of awards can be found on page 18.

Our Ph.D. program continues to attract excellent students. Eight Ph.D. students received NSF fellowships this year, as did one of our graduating seniors. The list of awards (p. 19) received by our students is impressive.

We organized our first career "trek" in Boston last year for students to engage with potential employers. We plan to continue and expand these offerings, particularly given the growth of the undergraduate major and continued healthy Master of Engineering (M.Eng.) program.

Space has been an ongoing challenge over my four years but even predates me. After some starts and stops, the good news is that our overall plan remains more or less the same from last year. Our teaching space will be co-located with the freshman biology teaching labs in Comstock Hall. The plans have been scaled down somewhat and are more focused now, which will we hope allow faster progress. We added a design studio and maker space in the basement of

THE BME MISSION

To educate students to understand the human body as an integrated system and the mechanisms of disease through quantitative engineering analysis, and to use that understanding to design better therapeutic strategies, devices, and diagnostics to improve human health.

Weill Hall to tide us over until the Comstock plan is completed. Between the Master of Engineering projects and senior design course, the space is vibrant and well used.

Finally, one of the best aspects of being director is meeting alumni. I enjoyed gatherings in Boston, Palo Alto, San Francisco, Austin and Dublin this past year. We hope to host BME alumni again in the Bay area in January and look forward to seeing many of you at the annual Cornell Engineering reception in San Francisco. Thank you for your engagement and support!

Sincerely,

Marjolein C.H. van der Meulen
James M. and Marsha McCormick
Director of Biomedical Engineering
Swanson Professor of Biomedical Engineering

ABOUT THE COVER

Cover design by Rob Kurcoba

Class of 2018: B.S. in BME graduates outside Weill Hall on May 26, 2018.

CORNELL BME NEWSLETTER

is published once a year by the Meinig School of Biomedical Engineering at Cornell University.

Director:
Marjolein van der Meulen

Managing Editor:
Nozomi Nishimura

Production Editor:
Kathryn Henion

Photography by: Suzanne Aceti Koehl, Cornell University Photography, Robyn Wishna, & Heather Ainsworth

2018 ADVISORY COUNCIL

David Anderson
Gentis, Inc.

William Bentley
University of Maryland

Albert Di Rienzo
Radicle Innovation, LLC

Fred Dinger III
Aerin Medical, Inc.

Avram Edidin
Exponent

David Farrar
Abbott

David Fischell
Angel Medical Systems

Virginia Giddings
Stryker Neurovascular

Deborah Leckband
University of Illinois—Urbana-Champaign

Gloria Matthews
MiMedx

Susan Margulies
Georgia Institute of Technology/Emory University

Larry McIntired
Georgia Tech

Donald Morel
West Pharmaceuticals (Retired)

Rich Newman
Syracuse University

Buddy Ratner
University of Washington

Beckie Robertson
Versant Ventures

George Truskey
Duke University

Bruce Tromberg
University of California, Irvine

Craig Wheeler
Momenta Pharmaceuticals

EX OFFICIO MEMBERS:

James McCormick
First Manhattan Consulting Group

FIRST UNDERGRADUATE CLASS GRADUATES: 2018

On May 27th, 2018, under a tent in the Weill Hall courtyard, the Meinig School held its commencement ceremony just as it has for the past 14 years. But this year was different: the tent was bigger, the program a few pages thicker, and the ceremony longer. In addition to celebrating the Ph.D. and M.Eng. candidates receiving diplomas, Meinig School faculty, staff, friends and families also cheered the 19 members of the School's first class of undergraduate majors.

"This day is the product of a decade-long process," said professor and undergraduate director Jonathan Butcher in his address at the undergraduate ceremony. "These first undergraduate biomedical engineering graduates represent the culmination of over 10 years of vision, planning and execution across Cornell University." He was referring to the process of bringing the biomedical engineering (BME) undergraduate major to Cornell. But for the full story, you have to go even further back than that.

ORIGINS

It began with Michael Shuler. In the mid-1990s, the Samuel B. Eckert Professor of Engineering, now emeritus, sought to develop a rich, internationally-recognized research program in biomedical engineering at Cornell. Under Shuler's leadership, the graduate field of biomedical engineering was created in 1997. In 2004, he founded the Department of Biomedical Engineering, and served as the James and Marsha M. McCormick Chair for 10 years. Although the initial focus was on graduate-level programming, just three years after the department was founded it became clear that incoming engineering undergraduate students were looking for a major in BME.

"College administrators and faculty were telling us that many engineering students would have majored in BME if they had the option available," said professor Lawrence Bonassar, one of the first BME faculty members.

So, in 2007, the first discussions began to explore an undergraduate BME major at Cornell. Early on these discussions included Pete Meinig, then a member of the Board of Trustees.

"Pete was very supportive and intrigued about the possibility of an undergraduate program," remembers Bonassar. "His enthusiasm bolstered our resolve to embrace undergraduate education as part of the department's mission."

Initial planning began in 2008. Butcher recalled the "long, deliberate process" that followed "of deciding what we wanted the program to be and what kind of graduates we would produce." The developed plan laid out a program that maintained the department's initial vision for graduate research and education, focusing on a quantitative, multi-scale understanding of physiology and pathology. The plan also integrated application- and concept-driven coursework across a core curriculum with options for four concentrations—biomaterials and drug delivery; instrumentation and imaging; biomechanics and mechanobiology; and molecular, cellular and systems engineering—that were reverse-deigned from a survey of post-collegiate engineering positions in the biomedical technology space.

After seven years of planning, and with the support of college and university leadership, the BME faculty submitted a major plan to the College of Engineering in 2013. The plan was approved by the College in 2014 and was granted NY State accreditation in June 2015. Also in June 2015, the Meinig Family announced a $50M gift to expand the department into the Nancy E. and Peter C. Meinig School of Biomedical Engineering, just in time to meet the increasing demand from students. In fact, a 2015 survey confirmed that 60 percent of the incoming engineering freshman class had an interest in biological applications of engineering. With all the program approvals met, thus began a summer of frantic curriculum planning and implementation to begin affiliating students that fall.

"Every process and associated documents required for the major—including affiliation requirements, flow charts, enrollment checklists—had to be created in a few months," said professor and current Meinig School director Marjolein van der Meulen. "Because of uncertainty regarding the state approval process and final form of the curriculum that would be allowed, we could not start these activities earlier." As associate director, Jonathan Butcher led the development of these "nuts and bolts" so that the long-awaited undergraduate major in biomedical engineering could begin affiliating sophomores into the program in fall 2015. "Jonathan's contributions to our new major design and curriculum implementation have been immense," said van der Muelen.

Jordan Harrod '18 was thrilled when news broke that Cornell would offer an undergraduate major in biomedical

Class of 2018: B.S. in BME graduates outside Weill Hall on May 26, 2018. (photo: Heather Ainsworth)

engineering. "[BME] was actually the major I wanted to study when I applied to Cornell, but since it wasn't offered at the time, I had planned to be a BEE major with a BME minor. Once the department announced that the undergraduate program would be starting my sophomore year, I immediately switched over."

After a semester working out curriculum logistics with students and the college, the Meinig School welcomed Harrod as one of 19 affiliated sophomores to the inaugural class in January 2016. And those students hit the ground running.

WORK IN PROGRESS

Of course there are bright spots and challenges to being the first class of a new major. From a faculty perspective, one challenge came in advising and scheduling for those first students. "The process required that we couldn't advertise this major to incoming students until its final approval," said Butcher, "which required students to rapidly reorient their courses to meet affiliation requirements once approved."

Butcher also recalled some scheduling snafus and the challenges of presenting 3rd-year courses meant to prepare students for 4th-year courses that hadn't been fully designed yet.

"It was a bit like running a startup," says van der Meulen. "Students gave more feedback than usual, and had a hand in finessing the program's design."

And what do the first graduates say of their experience? A survey turned up some themes. One was in regards to the curriculum's application-focused nature. "Working in the new design lab spaces has been incredible," said Julia Telischi. "All of the labs in my BME courses have given me exposure to currently used research techniques

FIRST CLASS GRADUATES

and real-world applications of my coursework."

Erica Sadler agreed. "There's a strong focus in our classes about being hands on, so I've gotten to perform many experiments and projects on my own rather than just learn about them in a classroom setting."

Also of note was the value of the curriculum's requirement to explore BME sub-specialties. "It made me see some things I would never have tried," said Elizabeth Weiss, a Hunter R. Rawlings III Cornell Presidential Research Scholar, "[and] helped me explore other areas of BME, which led me to realize I would like to pursue Ph.D. research in imaging."

Of the senior design course, her favorite of the program, Allison Byrne said, "My team and I had the opportunity to work with a neurosurgeon from Weill Cornell Medicine in an effort to improve the current immobilization methods for patients undergoing stereotactic radiosurgery. It was exciting to apply what I have learned over the past three years to a project with real significance."

By far the most cited positive from students was the sense of community and support that grew out of being part of the first class. Rohan Roy was surprised by the close interactions he had with graduate students in the major, who "really served as mentors and helped tremendously with coursework and career decisions. I am thankful for the close community."

"The small class size and the relationships that have grown out of being a part of something new is something I truly appreciate," said Margaret Hale.

But this appreciation is two-way.

"This was an incredibly motivated group of students," said Ryan Sauve, undergraduate coordinator for BME, of the School's first class. Within their first semester, Sauve remembers, members of the class founded Cornell's inaugural undergraduate chapter of the Biomedical Engineering Society (BMES). Like the previously established graduate chapter, the organization brings members together as a community for social, outreach, policy, and extracurricular events, adding another dimension to the program.

Another example of this group's drive is their success translating class projects into real-world conversations. Students in associate professor Chris Schaffer's science policy boot camp turned a class discussion into an op-ed article on utilizing artificial intelligence for health care. The article was published on Syracuse.com shortly after graduation.

These students are already receiving accolades for their work. At this year's design project showcase and industry-engagement day, an event at which industry representatives evaluate student projects in a shark-tank style competition, an undergraduate team won first place for both the pitch and design competitions for their presentation on an accurate, user-friendly system capable of monitoring mouse heart rate, respiratory rate, and temperature under anesthesia.

"I was impressed by the exceptional quality of our undergraduate seniors," said M.Eng. director and professor of practice Newton de Faria, who organized the event, of the winning team. "These are well grounded and well-rounded engineers capable of taking initiative executing on complex engineering design processes."

Newton de Faria (far right) with undergraduate team MousePad, winner of the Industry Day design project showcase. (photo: Suzanne Aceti Koehl)

But you don't have to take de Faria's word for it. In fact, the program's value was reflected in its national ranking. Before a single student had even graduated, the Meinig School debuted at #20 in the *US News & World Report*'s 2017 undergraduate BME programs listing.

Much of the credit for this success, says Butcher, goes back to Mike Shuler's vision. "We can thank [Mike] for appropriate phasing of the program. The Ph.D. and M.Eng. programs were already established so that undergraduate major is the crowning achievement of the program, fruit from building a strong faculty, research, and pedagogy."

OUTLOOK

Whether it's the students or the faculty that make a program, likely a combination, one thing is for sure: BME's first B.S. graduates are going places. But where are they going? As far as career outlook, says Sauve, they are "pretty evenly split between industry, pre-med, and further graduate study."

As far as the future, the program is slated to grow, with 50 students comprising the class of 2020. No matter what the future brings, this first class has made its mark on the program.

"As faculty, we are very proud of the work these students have put in as they have grown with us in this new experiment," said Butcher at the commencement ceremony in May. "We are also very thankful to their parents, relatives, and friends, who have also supported these students through many long nights. These young men

and women have achieved greatly."

"We are really fortunate to have such an incredibly talented first graduating class," van der Meulen agreed. "As the first, this group is special. They have set a high bar that will be standard for years to come, not only for academics but also for engagement. We couldn't be prouder. I look forward to hearing about their future successes at reunions."

For more information on the first class graduates, including video spotlights, visit: www.bme.cornell.edu.

"AS FACULTY, WE ARE VERY PROUD OF THE WORK THESE STUDENTS HAVE PUT IN AS THEY HAVE GROWN WITH US IN THIS NEW EXPERIMENT. WE ARE ALSO VERY THANKFUL TO THEIR PARENTS, RELATIVES, AND FRIENDS, WHO HAVE ALSO SUPPORTED THESE STUDENTS THROUGH MANY LONG NIGHTS. THESE YOUNG MEN AND WOMEN HAVE ACHIEVED GREATLY."

—Jonathan Butcher, Professor and Undergraduate Director

SPOTLIGHT ON GRADUATES

Allison Byrne

Hometown: Basking Ridge, N.J.
Why BME: My favorite subjects were always math and science and I wanted to pursue a career in a discipline that would allow me to use these passions to help others.
What's next: A Master of Engineering (M.Eng.) in biomedical engineering at Cornell.

Hannah Childs

Hometown: Seaville, N.J.
Why BME: I get to experience all of the best parts of physiology and human health, from the macroscale to the nanoscale perspective, and I am not limited to textbooks in my learning.
What's next: M.S./Ph.D. in Biomedical Engineering at Columbia University.

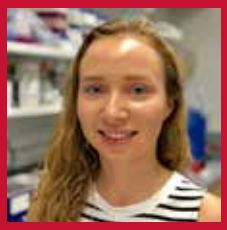
Jordan Harrod

Hometown: Montclair, N.J.
Why BME: I've always been interested in medicine and engineering but wasn't sure that I wanted to be a doctor, so I decided BME was the best way to combine them.
What's next: A Ph.D. in medical engineering & medical physics at Harvard-MIT Health Sciences & Technology as a GEM Fellow.

Rohan Roy

Hometown: Cheshire, C.T.
Why BME: I have always held a fascination with biology, and I felt like biomedical engineering is a new field with a lot of potential. I wanted to use my engineering skills in a way to directly improve the health of patients.
What's next: An M.Eng. degree at Cornell and applying to M.D./Ph.D. programs for matriculation in 2019.

Erica Sadler



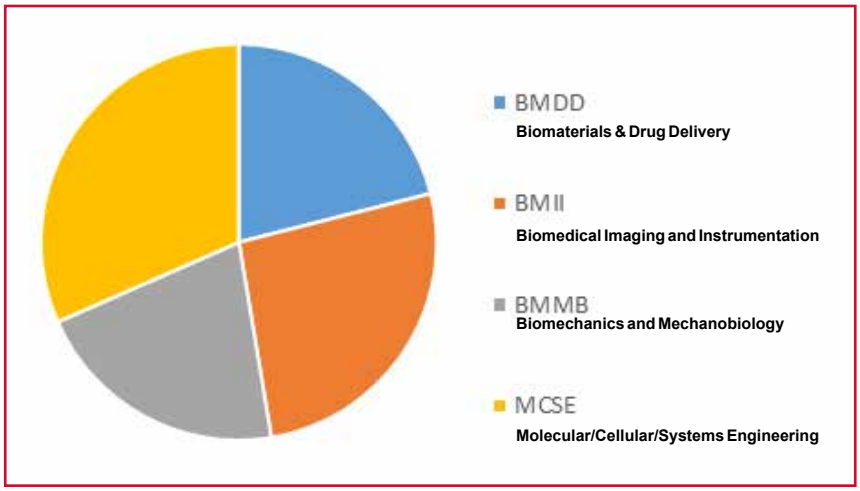
Hometown: Columbia, M.D.
Why BME: I knew I wanted to be pre-med, but I have always loved math and enjoyed a high school coding class. I felt like BME would be the best path to incorporate all my interests.
What's next: A two-year research position through the NIH's post-baccalaureate program. Then I'll apply to M.D./Ph.D. programs.

Elizabeth Weiss

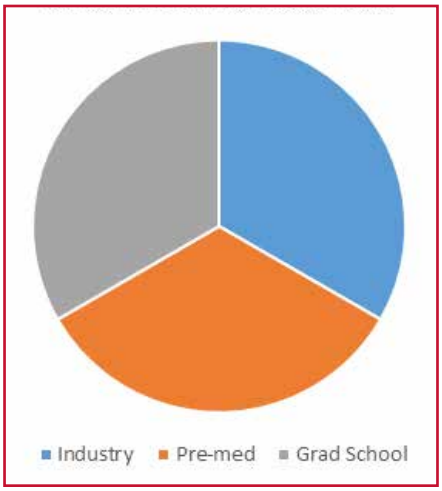
Hometown: Capron, I.L.
Why BME: I really value having relevant applications that are interesting to me presented with course material, and I felt BME was best suited for offering me that.
What's next: M.D./Ph.D. program at Northwestern with the plan of attaining a Ph.D. in Biomedical Engineering.

CLASS OF 2018 BY THE NUMBERS

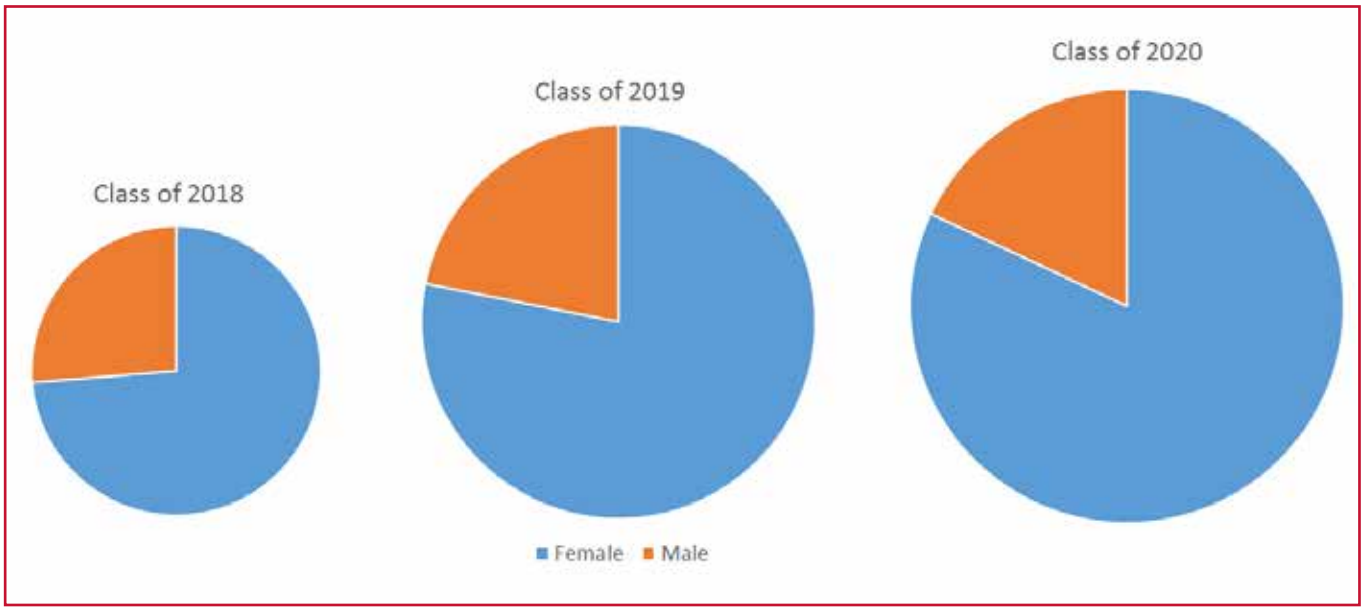
Class of 2018 by Concentration



Class of 2018 Careers



BME Classes: Enrollment



SYMPOSIUM HONORS MICHAEL SHULER, BIOENGINEERING PIONEER

by Syl Kacapyr

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 fully chemical-kinetics engineering approach to understanding metabolism and signaling and gene regulation. He was doing systems biology 20 years before that term existed."

Michael Shuler, eighth from left, the Samuel B. Eckert Professor Emeritus of Engineering, with former students at a symposium honoring his career. (photo: Thomas Hoebbel)

"[A SCHOOL OF BIOMEDICAL ENGINEERING] WASN'T JUST HIS VISION, IT WAS ALSO HIS PERSEVERANCE AND HARD WORK."
—Marjolein van der Meulen, the James M. and Marsha McCormick Director of Biomedical Engineering

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.

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.

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.

Michael Shuler speaks at the symposium. (photo: Thomas Hoebbel)

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.

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.

"YOU NEED TO BE ABLE TO BALANCE YOUR FAMILY AND WORK, ESPECIALLY IF YOU'RE GOING TO DO THIS FOR 30, 40, 50 YEARS."
—Michel L. Shuler, Samuel B. Eckert Professor of Engineering

"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.

WATCH!
For more photos, video, and press about the Shuler Symposium event, visit bme.cornell.edu.

FACULTY RESEARCH

CELL-FREE DNA MAY BE KEY TO MONITORING URINARY TRACT INFECTIONS

A new method for testing urinary tract infections yields more information than what conventional methods can offer, according to new research from investigators at Weill Cornell Medicine, Cornell's Meinig School of Biomedical Engineering and NewYork-Presbyterian.

In a study published June 20 in Nature Communications, researchers analyzed pieces of DNA, called cell-free DNA, isolated from the urine of kidney transplant patients. They discovered that this DNA provides valuable information about the bacterial and viral composition found within patients' urine.

"With just one test, many pieces of information about bacteria and viruses, as well as antibiotic resistance, can be determined at the same time," said co-lead author Iwijn De Vlaminck, assistant professor of biomedical engineering.

De Vlaminck said he hopes to do a validation study to see if this test can be implemented into practice. This new test not only could be important for kidney transplant patients, who frequently contract viral and bacterial urinary tract infections, but also for the general population.

Read more:
"Urinary cell-free DNA is a versatile analyte for monitoring infections of the urinary tract." Philip Burnham, Darshana Dadhania, Michael Heyang, Fanny Chen, Lars F. Westblade, Manikkam Suthanthiran, John Richard Lee & Iwijn De Vlaminck. *Nature Communications* 9, Article number: 2412 (2018).

NEW MICROSCOPY METHOD COULD BENEFIT STUDY OF MIGRATING CANCER CELLS

Assistant professor Steve Adie and team have come up with a way to use pressure from pulses of laser light to create sub-nanometer shifts of micrometer-sized particles embedded in soft tissue-like media. The displacement of the particles is measured by a second beam in a process called photonic-force optical coherence elastography (PF-OCE).

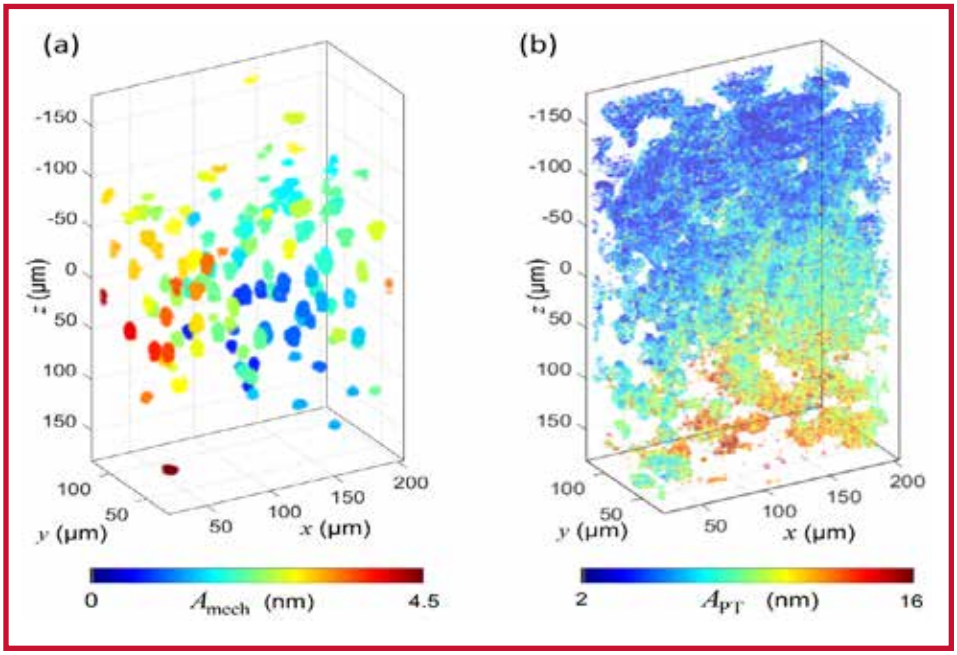
The first beam "jiggles the beads up and down," Adie said, and their displacement values are measured using optical coherence tomography—a second laser beam—giving the researchers an idea of the local mechanical properties of the medium surrounding each bead.

This technique, recently published in Nature Communications, has the potential to change how biomedical scientists study the relationship between cells and their environment, particularly when using engineered tissue cultures such as organoids. It also allows for time-lapse 3D mechanical microscopy, something that was not possible using traditional methods.

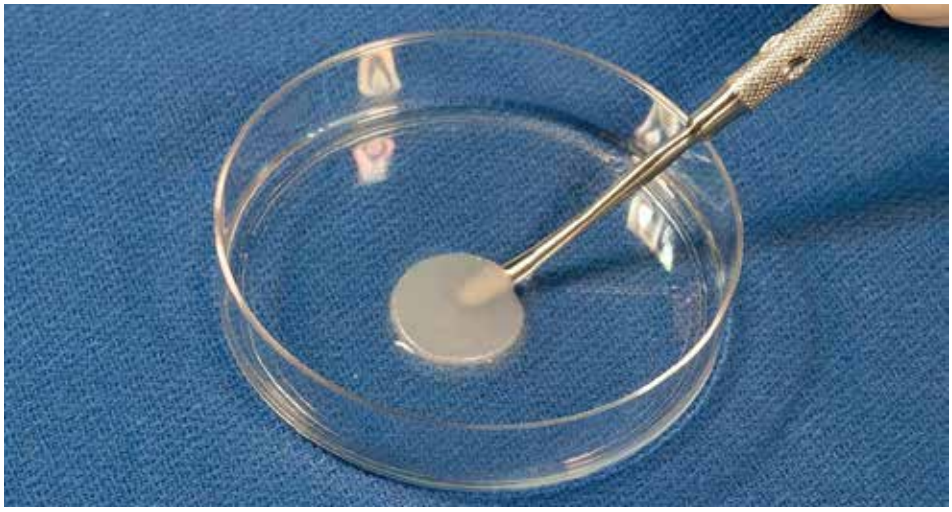
"In the field of mechanobiology," said Adie, "3D environments are really necessary in order to properly study the biological behavior and role of mechanical interactions between cells and their microenvironment."

This technique, Adie said, will be useful in studying the interaction of cells—including migrating cancer cells—on their environment.

Read more:
"Photonic force optical coherence elastography for three-dimensional mechanical microscopy." Nichaluk Leartprapun, Rishyashring R. Iyer, Gavrielle R. Untracht, Jeffrey A. Mulligan & Steven G. Adie. *Nature Communications* 9, Article number: 2079 (2018).



Comparison of mechanical and photothermal responses in photonic-force optical coherence elastography.



A sample of the NeoCart implant, tissue-engineered knee cartilage.

BONASSAR GROUP HELPS DEVELOP NEW CELL THERAPY

NeoCart—a cell therapy that uses a patient's cells grown in a collagen scaffold to repair knee cartilage defects—is in the final phase of a U.S. clinical trial thanks in part to research and development from the lab of Larry Bonassar, Daljit S. and Elaine Sarkaria professor of biomedical engineering and of mechanical and aerospace engineering.

Regenerative medicine company Histogenics announced an $87 million licensing agreement with biomedical technology firm Medinet to develop and distribute NeoCart in Japan. Bonassar said Cornell-based efforts played a significant role in the deal.

"We believe we have contributed to their having a really much more in-depth understanding of how their product works," Bonassar said of Histogenics. "And I think that has been integral in their ability to, in this case, talk to the regulatory agencies in Japan as well as potential commercial partners there."

NeoCart is produced by harvesting cartilage cells from the non-weight-bearing cartilage surface of the patient's femur. The cells are expanded, embedded in a collagen scaffold and then incubated using a proprietary processor. One of the challenges for Histogenics was determining just how stiff the cartilage implant had to be to handle the wear and tear inside a knee joint.

"You can say, 'It needs to be exactly what the native tissue is,' but we know that's not true," said Bonassar. "But given that, how do we identify a threshold? How do you know when it's ready?"

Through some novel testing methods, the Bonassar Group identified a mechanical transition point that occurs during the cell-culturing process. Gradually, the cells fill in the "sponge holes" of the scaffold so that it goes from porous to solid, Bonassar said.

"What happens when you take something with a bunch of holes in it and squeeze it? Those pores basically buckle," he said. "But if you fill in the holes, eventually you'll reinforce those pores so they don't buckle. And we've been able to directly evaluate this process and demonstrate that if the pores are sufficiently full, you've reinforced the whole scaffold and it behaves differently."

Histogenics' sponsored research agreement with the Bonassar Group runs through 2019. Future goals include streamlining NeoCart's manufacturing process using 3-D printing technology.

IMMUNE-ENGINEERED DEVICE TARGETS CHEMO-RESISTANT LYMPHOMA

The lab of Ankur Singh has partnered with researchers at Weill Cornell Medicine to explore how fluid forces may relate to the most common type of chemo-resistant lymphoma tumors' drug resistance.

The team, which also included assistant professor of biomedical engineering Ben Cosgrove, has developed a "lymphoma micro-reactor" device that exposes human lymphomas to fluid flow similar to that in the lymphatics and parts of the lymph node.

In testing different subsets of diffuse large B-cell lymphoma (DLCBL), the group discovered that certain subsets, classified based on mutations in B-cell receptor molecules found on cell surfaces, responded differently to fluid forces. Most notably, the team discovered that fluid forces regulate expression levels of adhesion proteins known as integrins, as well as B-cell receptors.

The team found cross-talk between integrin and B-cell receptor signals that could help explain certain tumors' drug-resistance.

"It is pretty remarkable that subclasses of the same tumor respond differently to mechanical forces," said Singh. "If we can understand the role of all these biophysical stimuli, we may understand why some lymphomas are sensitive to treatment while others are refractory. Then we will be able to treat many more patients."

Read more:

"How Biophysical Forces Regulate Human B Cell Lymphomas." F. Apoorva, Alexander M. Loiben, Shivem B. Shah, Alberto Purwada, Lorena Fontan, Rebecca Goldstein, Brian J. Kirby, Ari M. Melnick, Benjamin D. Cosgrove, Ankur Singh. *Cell Reports* 23 (2): 499-511 (2018).

IMAGING TOOL COULD FIND EARLY SIGNS OF ARTERIAL PLAQUE

A brain imaging tool for neuroscience developed at Cornell could have unexpected benefits in research on another vital area of the body: the heart.

A research team led by Nozomi Nishimura, assistant professor of biomedical engineering, has applied multiphoton microscopy to the study of atherosclerosis—the buildup of plaque in the walls of the arteries. This buildup is a major cause of heart disease and stroke.

A descendant of the revolutionary two-photon microscopy born nearly 30 years ago in the Clark Hall laboratory of Cornell biophysicist Watt Webb, the Nishimura Group produced high-resolution images of the earliest evidence of plaque buildup—individual fat cells along the arterial wall—in mouse and human tissue samples.

"When you look at tissue under a microscope, there are a lot of indistinct features," Nishimura said. "But to have something that is this bright, that shows something very specifically related to the disease, is pretty exciting. We believe it has a fair amount of clinical potential because of that specificity."

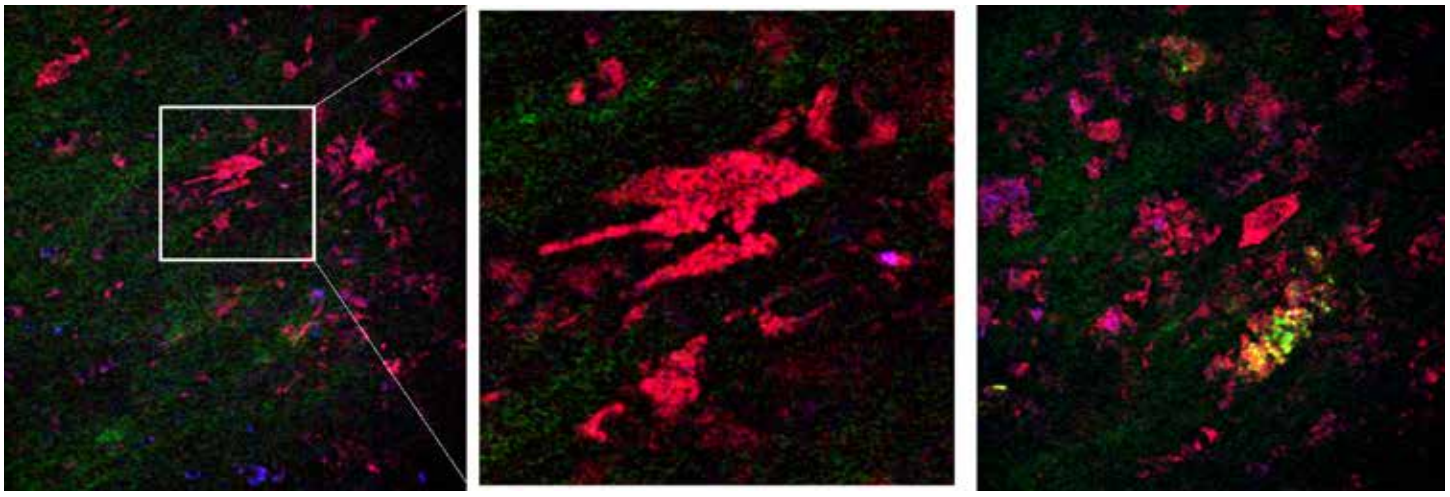
Nishimura had previously worked with the lab of Chris Xu that produced high resolution in vivo images of neurons firing deep inside the brain of a mouse. These startlingly clear images, using three-photon microscopy (3PM) developed in Xu's lab, got Nishimura thinking about other uses for the pioneering imaging technique.

"WHEN YOU LOOK AT TISSUE UNDER A MICROSCOPE, THERE ARE A LOT OF INDISTINCT FEATURES. BUT TO HAVE SOMETHING THAT IS THIS BRIGHT, THAT SHOWS SOMETHING VERY SPECIFICALLY RELATED TO THE DISEASE, IS PRETTY EXCITING. WE BELIEVE IT HAS A FAIR AMOUNT OF CLINICAL POTENTIAL BECAUSE OF THAT SPECIFICITY."
—Nozomi Nishimura, Assistant Professor

One of the additional signals produced when using 3PM for imaging is third harmonic generation (THG), which detects the interface between materials that respond differently to light. Whereas most optical techniques require inserting a fluorescent dye molecule or protein—which absorbs laser light and then radiates it back out, usually changing the color—THG doesn't require any dyes. The technique relies on the inherent properties of the structures being observed—for Nishimura's work, fat deposits.

Nishimura sees potential for clinical application of this technique combined with emerging endoscopic technologies.

Read more:
"Label-free imaging of atherosclerotic plaques using third-harmonic generation microscopy." D. Small, J. Jones, I. Tendler, P. Miller, A. Ghetti, and N. Nishimura. *Biomed. Opt. Express* 9, 214-229 (2018).



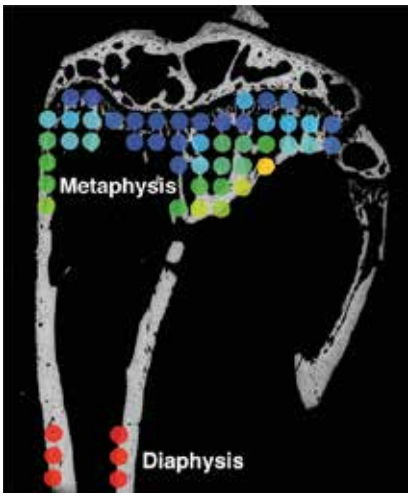
Atherosclerosis in human artery shown with third harmonic generation microscopy.

NOVEL STRATEGIES TO FIGHT PATHOGENS

Metastatic breast cancer affects bone mineral before spreading

An international collaboration led by Claudia Fischbach-Teschl—associate professor and co-director of the Cornell Center on the Physics of Cancer Metabolism—reports that not only does metastatic breast cancer favor a certain state of bone mineral, but that breast cancer tumors actually remotely enhance that favorable state—"talk," in effect, with the region of choice—before metastasizing there.

"Cancer is not only about the cancer cells themselves, but also about in which context they actually develop," Fischbach-Teschl said.



Laboratory-based small-angle X-ray scattering measurments of hydroxyapatite nanocrystals.

At the same time, this remote cellular interaction is taking place, the cancer cells are disrupting the bone's natural turnover, a constant process in which old tissue is shed and new tissue forms. Metastasis in the bone triggers a vicious cycle: Cancer cells migrate to a region that's suited for their growth, and their presence degrades the region, making it even more suited to tumor growth.

Growth plate region of the proximal tibia, a site of metastasis in mouse models of advanced breast cancer.

Gaining a greater understanding of the pre-metastatic niche, not only from a biological, but also a materials science perspective, could help inform therapeutic decisions in the future, Fischbach-Teschl said.

"The goal now is to really understand why these changes are happening," she said. "Why and how do tumor cells change these properties in bone prior to the formation of metastasis, and how is that then functionally relevant to seeding a new tumor?"

Read more:

"Multiscale characterization of the mineral phase at skeletal sites of breast cancer metastasis." Frank He, Aaron E. Chiou, Hyun Chae Loh, Maureen Lynch, Bo Ri Seo, Young Hye Song, Min Joon Lee, Rebecca Hoerth, Emely L. Bortel, Bettina M. Willie, Georg N. Duda, Lara A. Estroff, Admir Masic, Wolfgang Wagermaier, Peter Fratzl, and Claudia Fischbach. *PNAS* 114 (40): 10542-10547 (2017).

Sugar-coated vesicles prove effective in laboratory tests on deadly pathogens

Professors Dave Putnam and Matt DeLisa have joined forces with a group at Harvard Medical School to propose a better way to make conjugate vaccines for bacterial pathogens, including Haemophilus influenzae type b (Hib), a form of bacterial meningitis that kills thousands of infants annually in the underdeveloped world.

The method proposed by DeLisa and Putnam uses the versatility and ease of manufacture of outer membrane vesicles (OMVs), which the partnership has been developing for several years as a way to deliver targeted vaccines.

Animal models infected with two distinct and potentially deadly bacterial species—Staphylococcus aureus and Francisella tularensis—developed protective immunity against both when injected with the group's OMVs.

In February, Cornell and Harvard jointly filed a provisional patent application for their OMV protocol.

Read more:

"Immunization with outer membrane vesicles displaying conserved surface polysaccharide antigen elicits broadly antimicrobial antibodies." Taylor C. Stevenson, Colette Cywes-Bentley, Tyler D. Moeller, Kevin B. Weyant, David Putnam, Yung-Fu Chang, Bradley D. Jones, Gerald B. Pier, and Matthew P. DeLisa. *PNAS* 115 (14): E3106-E3115 (2018).

"A single dose and long lasting vaccine against pandemic influenza through the controlled release of a heterospecies tandem M2 sequence embedded within detoxified bacterial outer membrane vesicles." Hannah C. Watkins, Catalina L. Pagan, Hannah R. Childs, Sara Posada, , Jose Rios, Cassandra Guarino, Matthew P. DeLisa, Gary R. Whittaker, David Putnam. *Vaccine* 35 (40): 5373-5380 (2017).

MICROBIOME RESEARCHERS FROM AROUND THE WORLD GATHER AT CORNELL

by Syl Kacapyr

Researchers from around the world gathered at Cornell University, Aug. 6-10, 2018, for "Our Microbes, Our Global Health," a week-long meeting with workshops and a symposium that highlighted human microbiome research and strengthened ties between the global research community.

Researchers from over a dozen countries, including Brazil, China, India, Pakistan and South Africa participated in the workshops, which focused on the intersection between human microbiome research and global health issues such as infectious diseases, antibiotic resistance, nutrition and food security. The week included hands-on activities and social events before culminating in a day-long symposium.

The meeting was organized by Ilana Brito, assistant professor and Mong Family Sesquicentennial Faculty Fellow in the Meinig School, who was inspired to host it after receiving a Gates Foundation grant to study antibiotic-resistance genes in human microbiomes throughout the world. The research requires Brito to collaborate with scientists from almost every continent.

"It can be cumbersome," said Brito, noting international research requires building trust across long distances and different languages, as well as other logistical barriers.

"But then I had the realization that if I were to do that, build these collaborations in all of these different countries individually, then I would be missing a huge opportunity that was staring me in the face. Instead of building these individual collaborations, the idea that I had was I could basically bring everyone here to Cornell to build something that was greater than the sum of its parts," said Brito.

And that's exactly what the "Our Microbes, Our Global Health" meeting achieved, according to its participants. Olga Garcia, a professor at Universidad Autonoma de Queretaro, participated in the symposium where she presented her research on microbiota, obesity and metabolic disorders in children from rural Mexico.

"Coming to this meeting gives us exposure so other people know what research we're doing in our countries," said Garcia, "because sometimes they think that we don't have the infrastructure or capacity, both human and physical, for doing it. That is very important for us."

As the only faculty member at her university conducting microbe-related research, she said finding collaborators is key.

"Aside from my work with Ilana, now I have several projects and ideas with people from Colombia and Guatemala that came out of this week," said Garcia. "We've also been talking about several methods and techniques that are going to help me. That has been incredible."

Brito said the meeting was also successful in stimulating interest in microbiome research across Cornell, with participants coming from Weill Cornell Medicine, the College of Veterinary Medicine, the College of Agriculture and Life Science, and from multiple Cornell Engineering schools.

"This meeting embodies the radical collaboration ideas that are being promoted on campus. I think it's proof that this topic is really cross

Workshop participants.

Attendee brainstorming session at the microbiome workshop, held Tuesday-Thursday.

Event organizers (from L to R): undergraduate student Abi Anima, professor Ilana Brito, postdoctoral researcher Ana Maria Porras. (photos: Suzanne Aceti Koehl)

cutting and salient to people at Cornell," said Brito, who added that the meeting was supported by university entities such as Global Cornell, the Atkinson Center, the Mario Einaudi Center for International Studies, the Cornell Institute of Host-Microbes Interactions and Disease and the Office of the Vice Provost for Research.

As part of the effort to unite researchers, Brito sought to include undergraduate students as well. For some of them, it was their first introduction to global health topics through the lens of the microbiome.

Prior to the week-long meeting, Brito, along with Ana Porras, a postdoctoral associate in her lab, and Abi Anima, an undergraduate intern, helped establish a summer-long Microbiome Ambassador Program in which students learned about research concepts, ethics and logistics. The program included discussions with global partners and then culminated in the students meeting those people at the "Our Microbes, Our Global Health" meeting.

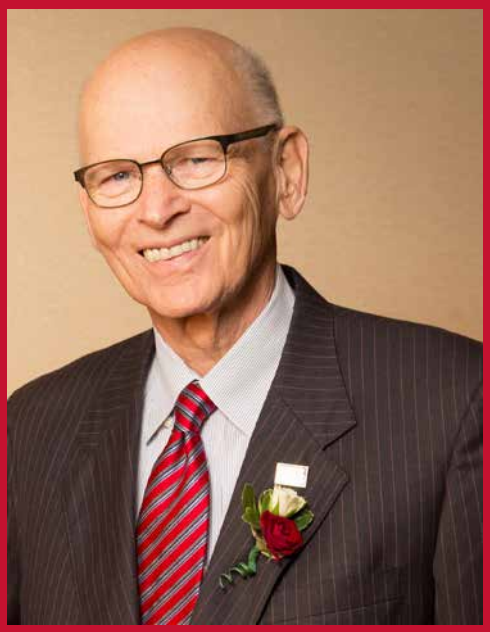
Noel Solomons, executive and scientific director of the Center for Studies of Sensory Impairment, Aging and Metabolism, said the inclusion of students was an important aspect of the meeting.

"Mentoring is as important to the success of science as the tools that are in the hands of the scientists," said Solomons. "Science will only move forward with opening the barriers to participation in every direction and every dimension, and that includes students and groups across the world."

Brito said she expects the relationships that were formed during the meeting to continue to strengthen, and that several research exchanges and partnerships between participants are moving forward, all at a critical time.

"Microbiome science is at a very exciting moment today," said Brito, "and it's poised to make significant improvements to understanding conditions such as malnutrition, obesity and vaccine efficacy. We've made large discoveries in the last few years and it's a very opportune time to look at topics of global health."

IN MEMORIAM



Peter C. Meinig '61, chairman emeritus of the Cornell University Board of Trustees, died September 25, 2017 in Colorado at the age of 78. Meinig, who first joined the board of trustees in 1991, served two terms as its chairman, from 2002 to 2011. Pete's accomplishments at and contributions to Cornell are many. Pete and his wife, Nancy Meinig '62, made significant and generous contributions to Cornell over the decades and were recognized as foremost benefactors; they both also served as presidential councillors.

In 2015, the Meinigs endowed the Nancy E. and Peter C. Meinig School of Biomedical Engineering, expanding and elevating what had been a department into a school at the center of the College of Engineering's focus on the multidisciplinary field of bioengineering. At the time, the gift—made along with their daughters, trustee Anne Meinig Smalling '87, Kathryn Meinig Geib, MBA '93, Sally Meinig Snipes, and their families—was the largest single philanthropic commitment by individual donors to a college on the Ithaca campus. We are forever indebted to Pete and the Meinig family for their outstanding generosity. He is sorely missed.

HONORS & AWARDS

CORE FACULTY

Steve Adie
Awarded NSF Career Award for his project entitled: " CAREER: Hybrid adaptive optics: a new paradigm for faster, deeper, volumetric microscopy in scattering media" and National Institutes of Health trailblazer award.

Ilana Brito
Awarded 2017 Kenneth Rainin Foundation Innovator Award for Inflammatory Bowel Disease research; National Institutes of Health Director's New Innovator Award; 2017 Packard Fellowship in Science and Engineering; $500,000 grant from the National Institute of Food and Agriculture; Research Excellence Award from the College of Engineering; longlisted, 2018 Nature Research Award for Inspiring Science; named Pew Scholar in Biomedical Engineering.

Jonathan Butcher
Named Fellow, American Heart Association (AHA).

Iwijn De Vlaminck
Awarded National Institutes of Health Director's New Innovator Award; Robert '55 and Vanne '57 Cowie Excellence in Teaching Award from the College of Engineering.

Claudia Fischbach-Teschl
Named 2018 Class of Fellows of the Biomedical Engineering Society (BMES).

Chris Hernandez
Awarded 2018 Fuller Albright Award from the American Society of Bone and Mineral Research (ASBMR).

Nozomi Nishimura
Awarded (with the Scientistas, a club for women in science), 2017 Changing the Face of STEM Grant from the L'Oréal USA For Women in Science Program.

David Putnam
Awarded Mr. & Mrs. Richard E. Tucker teaching award from the College of Engineering.

Mert Sabuncu
Awarded NSF Career Award for his project entitled: "CAREER: New Learning-based Algorithms for the Analysis of Very-Large-Scale Neuroimaging Data."

Chris Schaffer
Awarded $300,000 grant from BrightFocus Foundation for research on Alzheimer's disease.

Michael Shuler
Awarded 2018 BMES CMBE Shu Chien Achievement Award; 2018 Biotechnology and Bioengineering Gaden Award.

Ankur Singh
Awarded John Swanson '61 ME in honor of his mother, Dorothy G. Swanson, Excellence in Teaching Award from the College of Engineering; 2018 3M non-tenured faculty award; selected to serve on the board of *Science Translational Medicine*.

Marjolein van der Meulen
Awarded inaugural Adele L. Boskey Esteemed Award for Bone and Mineral Research from ASBMR.

STUDENTS & POSTDOCS

GRADUATE STUDENTS

Julia Chen (van der Meulen Lab) received a Young Investigator Travel Grant from ASBMR.

Alex Cheng (De Vlaminck Lab) awarded a graduate fellowship from the Natural Sciences and Engineering Research Council (NSERC) of Canada.

Aaron Chiou (Fischbach Lab) received an NIH NRSA F31 fellowship through NCI to study the role of breast cancer-derived factors in bone pre-metastatic niche formation.

Ben Cohen (Bonassar Lab) won second place in Cornell University's 6th Stem Cell Symposium Poster Competition.

Nicole Diamantides (Bonassar Lab) received the CELLINK 3D bioprinting Award at the 2017 TERMIS meeting; selected a Cornell Engineering 2018 Commercialization Fellow.

Andrea De Micheli (Cosgrove Lab) received Best Poster Presentation award at the 2018 FASEB Conference on Skeletal Muscle Satellite Cells and Regeneration.

Ashley Earle (Lammerding Lab) awarded BME Ph.D. Teaching Assistant of the Year.

Jason Guss (Hernandez Lab) won 1st place in Cornell's 3-Minute Thesis competition, sharing the People's Choice Award with **Derek Holyoak** (van der Meulen Lab), who took 2nd place in the competition.

Jeremy Keys (Lammerding Lab) received a 2018-19 Cornell Kavli Institute Knight@KIC Engineering Graduate Fellowship.

Kun Ho Kim and postdoc **Sharon Soueid-Baumgarten** (Cosgrove Lab) awarded Best Combined Poster Award at the American Society for Engineering Education (ASEE) St. Lawrence 2018 Section Conference.

Alexandra McGregor (Lammerding Lab) received a poster award at the National Cancer Institute Physical Science in Oncology Network (PS-ON) annual meeting in Boston.

LaDeidra (Monet) Roberts (Paszek Lab) received a Social Justice Award at Cornell's 2018 Graduate Diversity and Inclusion Spring Recognition Banquet.

Stephen Sloan (Bonassar Lab) received a TL1 Training Award, a Trainee Podium award for Outstanding Scientific Research at the 4th International Spine Research Symposium.

Madhur Srivastava (Freed Lab) selected/invited to attend "EPR Present and Future - SPP1601/SharedEPR Meeting and Silicon Valley Entrepreneurship Trek, and was awarded $1,375 in a pitch competition at eHub Collegetown through the Clinton Global Initiative University (CGIU).

Ashley Torres (Hernandez Lab) published a cover article in the *Journal of Bone and Mineral Research*.

Saloni Verma (M.Eng. student) selected as a delegate to the Clinton Global Initiatives University (CGIU) conference.

Ruisheng (Rick) Wang (Erickson Lab) awarded $1,375 in a pitch competition at eHub Collegetown through the Clinton Global Initiative University.

Sophia Ziemian (van der Meulen Lab) selected to receive the 2018 ORS/RJOS Young Female Investigator Travel Grant.

Ruisheng (Rick) Wang (Erickson Lab) and **Sylvia Zhang** (Nishimura Lab) were awarded first place for their presentation at the 2018 Duke/UNC CASE Competition.

Jill Middendorf (Bonassar Lab) and **Sophia Ziemian** (van der Meulen Lab) received 2nd-place awards for their student paper competitions at the World Congress of Biomechanics (WCB) 2018 meeting in Ireland.

Juan "JJ" Paredes (Andarawis-Puri Lab), **Ashley Torres** (Hernandez Lab), and **Tibra Wheeler** (Singh, van der Meulen Labs) each received awards at the Diversity Programs in Engineering 2018 banquet.

Daniel Rivera (Schaffer Lab), **Rebecca Irwin** (Bonassar Lab), **Matthew Tan** (Fischbach-Teschl Lab), **Andrea de Micheli** (Cosgrove Lab), and **Caroline Chlebek** (van der Meulen Lab) each awarded Graduate Assistantships in Areas of National Need (GAANN) fellowships.

UNDERGRADUATE STUDENTS

Paula Fraczek (Cosgrove Lab) won best combined poster at the American Society for Engineering Education (ASEE) St. Lawrence 2018 Section Conference.

Jordan Harrod awarded a 2018 BMES Student Travel Award.

Michael Heyang received ELI undergraduate research award from the College of Engineering.

Shannon Hugard (van der Meulen Lab) competed in the NCAA track and field Division I Championships in the 1500m.

Crystal Zhao (Bonassar Lab) awarded an Undergraduate Research Award from the Cornell Engineering Alumni Association (CEAA) for best individual research project.

Haley Antoine and **Jordan Harrod** each received awards at the Diversity Programs in Engineering 2018 banquet.

POSTDOCS

Oliver Bracko (Schaffer-Nishimura Lab) received a Postdoc Achievement Award for Excellence in Teaching & Mentoring.

Xiaochu Ding (Yadong Wang Lab) and team received a scale-up award of $40,000 from Cornell's College of Engineering to develop a polymer for protein therapy.

Ana Maria Porras (Brito Lab) recevied a Postdoc Achievement Award for Excellence in Community Engagement.

ALUMNI

Funmi Adebayo (Ph.D. 2017, van der Meulen Lab) named assistant dean for inclusion and engagement at the Graduate School at UMass Amherst, and received the Stryker/Orthopaedic Research Society Women's Research Fellowship.

FACULTY PROMOTIONS

Alumni Awards Continued

Peter DelNero, a 2017 Ph.D. graduate of the Fischbach-Teschl Lab accepted an invitation to join the National Cancer Institute's Cancer Prevention Fellowship Program in June 2018.

Michael Mitchell, a 2014 Ph.D. graduate of the King Lab, was selected a 2017 STAT Wunderkind.

Karin Wang, a 2015 Ph.D. graduate of the Fischbach-Teschl Lab, began an assistant professor position in bioengineering at Temple University.

MEET THE 2018 NSF FELLOWS

The Meinig School of Biomedical Engineering proudly congratulates Ph.D. students Jason Chang (Andarawis-Puri Lab), Monideepa Chatterjee (Andarawis-Puri Lab), Carolyn Chlebek (van der Meulen Lab), Joseph Long (Lammerding Lab), Brittany Schutrum (Fischbach Lab), Regan Stephenson (Singh Lab), Tibra Wheeler (Singh Lab), and Matt Whitman (Fischbach Lab), as well as one undergraduate senior, Joseph Kim (Cosgrove Lab), who each recently won a 2018 National Science Foundation (NSF) Graduate Research Fellowship (GRFP). The NSF GRFP offers three years of stipend support during a five-year fellowship tenure to applicants selected through a national competition.

2018 NSF Fellows L to R: Tibra Wheeler, Monideepa Chatterjee, Brittany Schutrum, Matt Whitman, Joseph Long, Regan Stephenson, Carolyn Chlebek; and Jason Chang (not pictured). (photo by Suzanne Aceti Koehl)

FACULTY PROMOTIONS

James Antaki
Elected the Lowell and Susan McAdam Professor of Heart Assist Technology.

Jonathan Butcher
Promoted to the rank of Professor.

Yadong Wang
Elected the McAdam Family Foundation Professor of Heart Assist Technology.

Lawrence Bonassar
Elected the Daljit S. and Elaine Sarkaria Professor in Biomedical Engineering.

David Putnam
Promoted to the rank of Professor.

NEW FACULTY

Nate Cira
Of the Rowland Institue at Harvard, will join the Meinig School as assistant professor in July 2020.

Esak Lee
Of the Wyss Institute, Harvard, will join the Meinig School as an assistant professor in July 2019.

THANK YOU, FRED DINGER

In March 2018, Fred Dinger III, '83 joined faculty to dedicate a room in the newly renovated BME Administrative Suite. Fred made this gift in honor of his time at Cornell Engineering and his son's, Brent Dinger '15, M.Eng. '16. Mr. Dinger is CEO and President, Aerin Medical, Inc., an active member of the Meinig School's Advisory Council and a frequent speaker on biomedical devices.

Photos L to R: Fred Dinger, III with Meinig School director Marjolein van der Meulen and the plaque designating the new room; BME faculty present for the dedication. (photos: Suzanne Aceti Koehl)

ALUMNI PROFILES

Funmi Adebayo, Ph.D. 2017

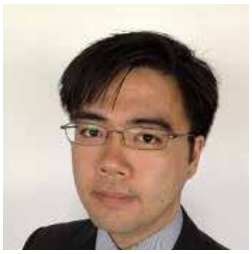
Olufunmilayo (Funmi) Adebayo received her B.S. (2011) in biomedical engineering and professional writing from Worcester Polytechnic Institute, and her M.S. (2015) and Ph.D. (2017) from Cornell University, under the mentorship of Dr. Marjolein van der Meulen. Her research focused on examining the relationship between knee joint kinematics and cartilage degradation in a load-induced preclinical model of osteoarthritis.

As a Ph.D. student, Adebayo was funded by an NSF Graduate Research Fellowship, a Sloan Graduate Fellowship, and the Robert and Helen Appel Fellowship for Biomedical Research. Outside the lab, she served as a coordinator for the LSAMP Program in the Office of Diversity Programs in Engineering, and as a Graduate Resident Fellow in Becker House.

After graduating, Adebayo joined the Biomechanics Department at the Hospital of Special Surgery (HSS) as a post-doctoral fellow. Under the mentorship of Dr. Suzanne Maher, she investigated the contact mechanics and kinematics of the human knee joint during injury. During her time at HSS, she was awarded the Stryker/ Orthopaedic Research Society Women's Research Fellowship.

In July 2018, Adebayo was appointed as Assistant Dean for Inclusion and Engagement in the Graduate School at the University of Massachusetts Amherst. In this role, she directs the Graduate School efforts to promote diversity and inclusion at UMass Amherst. Her goal is to support and empower students from traditionally underrepresented groups to successfully pursue and complete their graduate degrees.

Keigo Kawaji, Ph.D. 2012



Keigo Kawaji completed his Ph.D. in 2012 at the Cornell MRI Laboratory group at the Weill Cornell campus under the mentorship of Yi Wang (Thesis Advisor) and Martin Prince (Clinical Mentor). After a postdoc in BIDMC-Harvard in Boston in 2013, he joined the research staff at the University of Chicago Medical Center's Cardiac Imaging Center in 2014. Here, Dr. Kawaji helped establish the technical arm of the Cardiovascular Magnetic Resonance Imaging program as one of the very first staff-scientist appointees at the UofC Medical Center. With support from key collaborators in cardiology, radiology (brain MRI), and surgery (cardiothoracic surgery), he served in several key early-career investigator roles including principal investigator (PI) for several pilot awards that he successfully secured, co-PI for both industry and multi-center trial awards, and also as a co-investigator for several AHA and NIH awards.

In January 2018, Dr. Kawaji transitioned his primary affiliation to a tenure-track position in the BME Department at the nearby Illinois Institute of Technology (IIT)—an engineering school without direct hospital affiliation—where he now leads an effort through his joint appointment with UofC Medical Center to establish his research program in Magnetic Resonance Technology Discovery, or the MRTD Lab. MRTD's goals are: to bridge engineering at IIT with medicine at UofC and to disseminate the art of developing, validating, and clinically translating novel technologies for MRI systems. Specifically, Dr. Kawaji's research focuses on the technical development of novel MR-based quantitative biomarkers using the next-generation MRI instrumentation.

Jeerapond Leelawattanachai, Ph.D. 2014

Jeerapond Leelawattanachai completed her Ph.D. in biomedical engineering at Cornell under Prof. Moonsoo Jin. Her research focused on protein engineering, nanoparticle formulation, tumor targeting, and in vivo animal study. After her Ph.D., she returned to her home country, Thailand, and has been working as a researcher at the National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA).

Leelawattanachai is currently working on development of affordable diagnostic tools, focusing on tuberculosis (TB). This research closely follows the Thai national TB program of 2017 to promote TB research and lower the nation burden on TB management.

In 2017, Leelawattanachai received a New Research Scholar Grant Award from The Thailand Research Fund for young Thai researchers who demonstrate scientific and technical excellence in their fields and their research proposals.

In 2018, she was 2nd runner-up for the Young Scientist Award from Merck Ltd.; was selected as one of the Thailand representatives to participate in the 68th Lindau Nobel Laureate Meeting in Germany; and was selected by Japan Science and Technology Agency to participate in JST Sakura Science Plan.

Besides research, she has always been active and committed to science outreach activities. She regularly participates in NSTDA's outreach programs including being a guest speaker; an advisory committee member for a student science project competition; and a volunteer for Thailand Science Film Festival, Children's Day Festivities, and many health promotion campaigns.

Allison Pearlman, M.Eng. 2011

Allison Pearlman received her B.S. in biomedical engineering from Rensselaer Polytechnic Institute in 2010 followed by her M.Eng. in biomedical engineering from Cornell in 2011. While at Cornell, she was a TA and worked with her design team to develop an adapter to improve Transonic Systems' ultrasonic flow probe functionality with robotic surgical systems.

After graduation, Pearlman landed her dream job working as an R&D Engineer at Boston Scientific in Marlborough, MA in the Endoscopy Division. She started as an Engineer I supporting a line extension to the biliary metal stent, developing test methods and the design verification strategy. She then moved on to become the Technical Lead responsible for the biliary metal stent.

In 2015, Pearlman changed roles to become an R&D Project Manager, leading international cross-functional teams to develop and launch new products. She really enjoys the collaboration required to plan and execute complex programs. In an effort to advance her project management skills, she earned her PMP certification in 2016. She also was issued her first patent for a ligation band dispensing cap in 2016.

Pearlman is passionate about patient care and delivering innovative solutions to the medical community. Her reward is the satisfaction received knowing that the products she works on improve the lives of patients around the globe.

Jenny Puetzer, Ph.D. 2014

Jenny Puetzer completed her Ph.D. in the Bonassar Lab in 2014. Her research focused on using mechanical stimulation to engineer whole meniscal constructs with native-like collagen organization. This work gave her a great appreciation for the collagen fiber architecture of tissues throughout the body.

After graduating, she received a Whitaker International Fellowship to perform her postdoc in the group of Professor Molly Stevens at Imperial College London. Here she developed a system to further explore collagen fiber formation in multiple musculoskeletal tissues and developed materials capable of triggering dual-differentiation of human stem cells for osteochondral repair. Additionally, she was a member of the United Kingdom Regenerative Medicine Platform (UKRMP) Acellular Materials Hub, where she collaborated with researchers from across the UK to develop materials capable of guiding cells to regenerate tissues throughout the body.

In January 2018, Puetzer became an assistant professor at Virginia Commonwealth University in the Department of Biomedical Engineering. Her lab focuses on musculoskeletal tissue engineering for meniscus, tendon and ligament replacement, with particular interest in hierarchical collagen fiber formation, bone integration, and effects of aging and injury. The ultimate goal is to develop functional replacements with native organization and strength, primed for aged and inflammatory environments in vivo.

Karin Wang, Ph.D. 2015

Karin Wang earned her B.E./M.S. (2010) in biomedical engineering from Stony Brook University and her Ph.D. (2015) in biomedical engineering from Cornell University.

Under the supervision of Drs. Delphine Gourdon and Claudia Fischbach-Teschl, she leveraged her background in tissue engineering and biomaterials to probe the structure-function relationship of fibronectin in the developing tumor stroma. For this research, Wang received NSF DGE GK-12 fellowships, invitations to speak at national and international conferences, and travel awards from national societies.

Afterwards, Wang did her postdoctoral training at Harvard University with Dr. Jeffrey J. Fredberg. She worked at the interface of biophysics and cell biology to develop reductionist model systems to identify key physical factors driving collective migration during tumor development. For this research, she was awarded a NIH NCI Ruth L. Kirschstein F32 Postdoctoral Fellowship, CMBE Rising Star Award, and BMES Career Development Award.

As of August 2018, Wang is a tenure-track assistant professor in the Bioengineering Department at Temple University. Her lab is focused on integrating principles from tissue engineering, biomaterials science, physics, and cell biology to develop model systems and tools that probe cell-matrix interactions for biomedical applications. Using this interdisciplinary approach, she aims to identify and regulate key mechanobiological drivers of a range of human diseases, with a particular focus on cancer metastasis.

CornellEngineering

Nancy E. and Peter C. Meinig School of Biomedical Engineering

SUPPORT BME

Private gifts are essential and help to advance initiatives within BME that support our capital infrastructure, faculty recruitment and retention, graduate students, and programs. These are in line with the priorities of the Dean and help us to attract top faculty and students.

Our top priorities include our multiyear and multiphase plan to develop new space for the growth of the Meinig School's research and teaching programs as well as the need for startup funds as we continue to grow the faculty.

To make a gift, please use the secure online gift form at www.giving.cornell.edu, or send a check made payable to Cornell University to: Cornell University, PO Box 37334, Boone, IA 50037-0334.

Please be sure to indicate your intention to designate your gift to BME.

Corporate matching gifts can also be directed to BME. If your company has a matching gift program, please contact your HR director.

Cornell's financial advisors can assist you with a number of gift-giving tools (securities, trusts, bequests, and real estate) to meet your family's financial and philanthropic goals. Please visit the Office of Trusts, Estates, and Gift Planning website at: https://alumni.cornell.giftplans.org for more information, or call 1-800-481-1865.

For more information, please contact June Losurdo, 607-254-1643 or JML235@cornell.edu.