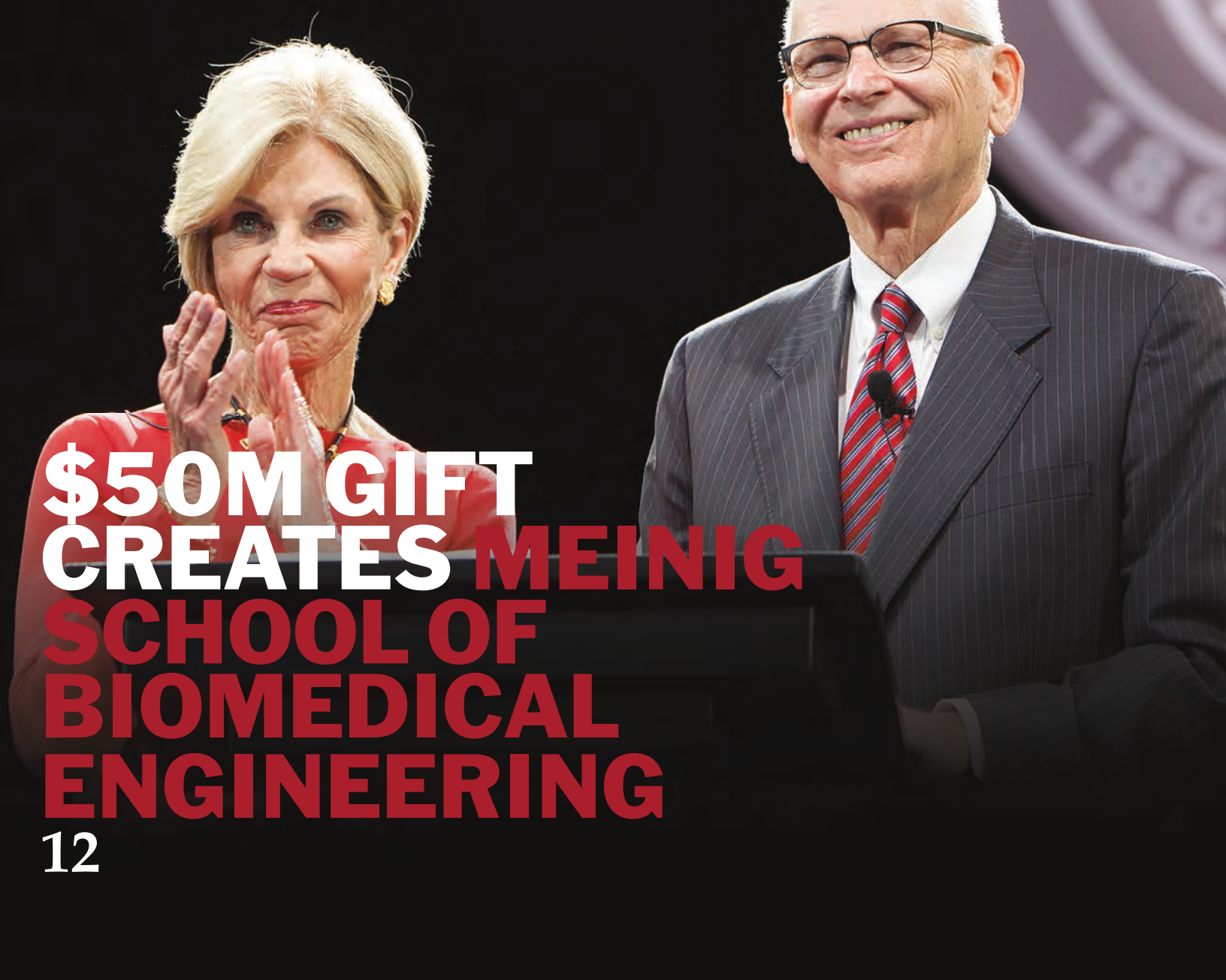
CornellEngineering
Nancy E. and Peter C. Meinig School of Biomedical Engineering

BME

Newsletter
September 2015



$50M GIFT CREATES MEINIG SCHOOL OF BIOMEDICAL ENGINEERING

BME MESSAGE

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

2014-2015 was a year of leadership transition in BME and for me personally in my first year as chair. The upcoming year will also be exciting and full of opportunities as a result of a couple of major milestones including commencing our new undergraduate major.

Let me start with a major recent milestone: The academic year ended on a high note when the College announced a $50M naming gift from the Meinig family that elevated BME from a department to the Nancy E. and Peter C. Meinig School of Biomedical Engineering. We are immensely honored to be recognized by the Meinig family with such a transformative gift to BME that will allow us to continue to grow and develop.

Additional changes of interest from the past year include faculty retirements, hires and promotions, several of which are detailed further in this newsletter. We had two substantial departures this year with the retirements of David Lipson and Jonathan Black. Both David and Jonathan have deep Cornell roots but were ready to move on to their next phase. For the past decade, David had been the face and leader of the Master of Engineering (M.Eng.) program. Jonathan had returned to Cornell to advise a series of successful M.Eng. projects. Their departures are a transition for the M.Eng. program, but also an opportunity to update the program and its goals. Our first step was to hire a new M.Eng. program director, Dr. Newton de Faria. Newton joins us from National Instruments, where he spent several decades. His extensive BME experience includes the BMES Board of Directors and the Industry Affairs Committee and serving as a member of the industrial advisory boards for the University of Rochester and Vanderbilt University, in addition to an adjunct professor of biomedical engineering appointment at the University of Connecticut.

Jan Lammerding was promoted to associate professor with indefinite tenure. Jan is appointed in BME and the Weill Institute for Cell and Molecular Biology. Jan's work on the mechanics of the cell nucleus is creative and impactful, with direct application to human disease. He will enjoy a sabbatical this year.

Two new faculty joined us in Ithaca, and one new faculty member was hired. Ben Cosgrove came to Ithaca last summer by way of the University of Minnesota, MIT, and Stanford. In January, Iwijn De Vlaminck also joined BME from Stanford after being at KU Leuven and Delft Institute of Technology. Both Ben and Iwijn's research was featured in our 2014 *BME Newsletter* as well as in this newsletter. Ilana Brito was hired as an assistant professor and will move to Ithaca next summer. Currently a postdoctoral fellow in biological engineering with Professor Eric Alm at MIT, Ilana focuses on the microbiome using quantitative gene sequencing methods, work that is also described further in this newsletter.

On the student side, our graduate program continues to thrive. In 2015 we graduated 16 Ph.D. and 69 M.Eng. degrees. As our faculty continues to grow, so will the size of our graduate program.

Cornell's leadership is changing with the retirement of President Skorton, whose campus appointment was in BME. New university President Beth Garrett has expressed strong support for BME. The recent selection of the new provost, Michael Kotlikoff, whose background in the life sciences, will help us manage the space limitations that we are facing due to a significant increase in the number of BME researchers and students. Kimball Hall is newly renovated and will be a critical site for laboratories for new faculty hires. Teaching and departmental space have yet to be identified, we hope within the Biotechnology Building and Stinson Hall corridor adjacent to Weill Hall.

As a final note, this summer BME received approval from New York State for the new B.S. degree in biomedical engineering. This step is essential to becoming a full-fledged department.

THE BME MISSION

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

Interest in the major is robust, and we expect the need to cap enrollments for the first several years as we launch the undergraduate program. We have spent the summer ironing out details on how we will implement the major and creating all supporting documentation. These efforts are being led by Jonathan Butcher, who succeeds Larry Bonassar as the associate chair and director of undergraduate studies. Jonathan provides a great deal of ideas and energy at this critical junction in our history.

It is an exciting time for Cornell BME. The combination of our transition to the Meinig School and the addition of an undergraduate major really sets the stage for the future of Biomedical Engineering at Cornell. Please enjoy reading about further highlights in the following stories.

Sincerely,

Marjolein C.H. van der Meulen

James M. and Marsha McCormick Chair of Biomedical Engineering

Swanson Professor of Biomedical Engineering

ABOUT THE COVER

2015 Charter Day Weekend: Nancy and Peter Meinig speak at the Sesquicentennial Dinner.

CORNELL BME NEWSLETTER

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

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Photography: All photos by University Photography unless otherwise noted.

NSF GRADUATE RESEARCH FELLOWSHIPS

MEET THE 2015 NSF FELLOWS

The Department of Biomedical Engineering proudly congratulates the four students who won the 2015 National Science Foundation's Graduate Research Fellowship. Two winners from the Reinhart-King Lab are investigating how mechanical stimuli can change the behavior of cells such as vascular cells. Danielle LaValley will investigate the inherent differences between mechanosensitivity of tumor-derived and healthy endothelial cells. This work will help to identify microenvironmental mechanical and chemical cues that mediate vascular hyperpermeability occurring during tumor angiogenesis. Jacob VanderBurgh will work on engineering in vitro platforms to study the impact of heterogeneities in vascular stiffness upon endothelial cell function. Dan Cheung, in the Butcher Lab, will work on the underlying mechanisms that control stem cell fate to develop methods to make tissue engineered heart valves. He will investigate the effects of age-specific stiffness on the differentiation of mesenchymal stem cells towards valve-like cells within 3D bioprinted hydrogels. He will also study the effects of hemodynamic conditioning on tissue remodeling and mesenchymal stem cell differentiation. Terence Gee, also from the Butcher Lab, will study the role of cell signaling pathways (VEC-specific NFkB-Notch1 coordinated signaling) in the initiation and progression of aortic valve disease. This coordinated signaling may mediate the effects of disordered valvular hemodynamics and paracrine signaling to generate positive feedback that perpetuates the disease. He will also determine the in vivo pathophysiological consequences of the resulting modulation of valve endothelial cells.

NSF Fellowship winners Terence Gee, Danielle LaValley, Dan Cheung, and Jacob VanderBurgh.

Nicole Diamantides (Bonassar Lab), Rachel Gilbert (Lammerding Lab), Jason Guss (Hernandez Lab), and La Deidra Roberts (Paszek Lab) received honorable mentions.

PROMOTIONS & TENURE

Jonathan Butcher became the new associate chair and director of undergraduate studies. *Effective September 2014.*

Michael King was appointed the Daljit S. and Elaine Sarkaria Professor of Biomedical Engineering in recognition for his outstanding accomplishments in research, teaching, and service. *Effective May 2015.*

Jan Lammerding was promoted to the rank of associate professor. *Effective April 2015.*

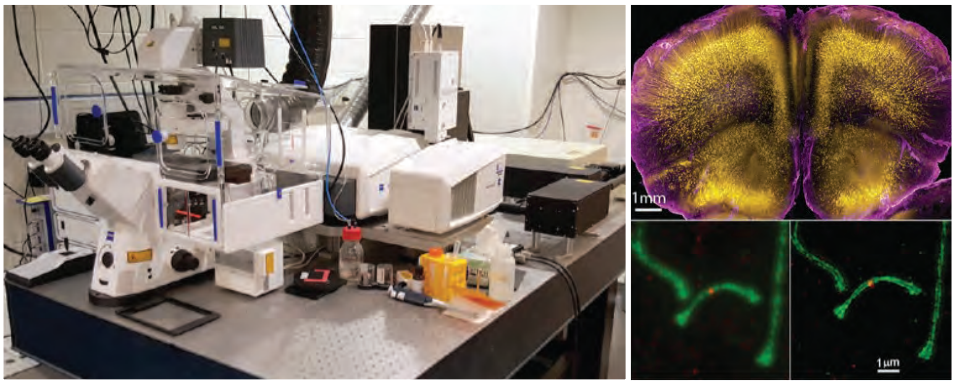
Congratulations to these colleagues on their outstanding achievements and well-deserved promotions!

NEW HIGH-POWERED MICROSCOPES FOR STEM CELL RESEARCH

Cornell has led the development of advanced optical microscopy and fluorescence-based techniques for biomedical research since the 1970s. In this tradition, Prof. Warren Zipfel (BME) and Dr. Rebecca Williams (Director of the Biotechnology Resource Center (BRC) Imaging Facility) recently secured more than $2.5 million from various sources (NIH, NSF, and NYS) to purchase three user-friendly, high-end instruments that are now part of the BRC Imaging Facility and the New York State Stem Cell Optical Imaging Core. Installed in 2015, these new instruments include two combined confocal/multiphoton microscopes and a super-resolution instrument capable of resolving objects as small as 20 nm. Many of the technologies now part of these commercial instruments, such as multiphoton microscopy, were originally developed at Cornell. Along with the other light microscopes, a fluorescence cell sorter, micro- and nano-CT instruments, and the high-resolution ultrasound technologies available at the imaging facility, Cornell researchers across campus now have access to a complete set of modern imaging and fluorescence analysis tools.

Cornell's reputation as a microscopy powerhouse started with Watt Webb's group (Applied & Engineering Physics) who pioneered fluorescence recovery after photobleaching (FRAP) and fluorescence correlation spectroscopy (FCS). The invention of two-photon (or multiphoton) microscopy in 1990 by the same group resulted in a new form of 3D micrometer-scale microscopy that enables deep imaging, even in living samples. Prof. Webb is now Emeritus, but many alums of his lab remain at Cornell. Zipfel, previously a researcher with Webb, is an associate professor in BME and Williams, who got her Ph.D. under Webb, is an adjunct professor in BME as well as the BRC Imaging Facility Director. Zipfel and Williams both helped develop and commercialize multiphoton microscopy in the 1990s. In the mid-2000s, as a new class of fluorescence microscopy known as super-resolution microscopy emerged, the Zipfel lab built an instrument based on this technique. These types of light microscopes are called "super-resolution" because they can acquire images that surpass the resolution limit, known as the diffraction limit, of a conventional microscope. With a conventional microscope, any object smaller than 250 nm still looks like a 250-nm-wide spot, but super-resolution microscopes can improve resolution by two- to ten-times.

In 2006 Zipfel and Williams moved to BME, merging their microscopy development center with a new incarnation of the BRC Imaging Facility. The majority of the lab instruments were home-built, therefore providing custom functionality for specific tasks, but they were often not very user-friendly. The BRC facility had two relatively new confocal microscopes, but its multiphoton microscope was a two-decades-old confocal microscope converted to multiphoton functionality by the Zipfel lab in 2000. Today, with the new acquisitions, the BRC is a Life Sciences Resource Center that, in addition to the latest advances in imaging, runs core facilities for genomics, proteomics, genomic diversity, bioinformatics, and bio-computing.



(Left) One of the recent microscope additions to the BRC/BME imaging facility with 3D super-resolution imaging. (Right Top) Confocal microscopy of a mouse brain slice (forebrain and olfactory bulbs) in which the neurons are labeled with yellow fluorescent protein (courtesy of Andrew Recknagel and Melissa Warden). The image is a composite of many images so that the resolution is better than 1 micrometer over a large area. (Right Bottom) Comparison of a conventional fluorescence image (left panel) of a mouse chromosome with a super-resolution image (right panel) taken with the new Zeiss Elyra super-resolution microscope (courtesy Melissa Toledo and Paula Cohen).

COLLABORATIVE RESEARCH PROJECTS

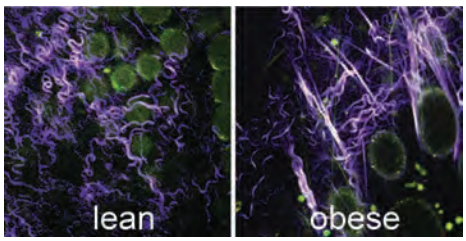
INTERDISCIPLINARY COLLABORATION DRIVES NOVEL RESEARCH

The Cornell BME department's collaborative and open culture accelerates the pace of innovation and invention, leading the way to better health and new discoveries. The BME department has many ties with faculty at Weill Cornell Medical College across multiple departments, both academic and clinical. All the first year BME Ph.D. students spend a summer at Weill Cornell in the Immersion Program, working with physicians and seeing patients. In addition, Cornell provides institutional support for new collaborations in seed grants and hosts retreats attended by both engineers and physicians to talk about medical innovation. Such connections lead to interdisciplinary ideas that are targeted towards critical problems in healthcare. Since its founding, the BME department has had a long standing relationship with the Hospital for Special Surgery (HSS). Cornell biomedical engineers Larry Bonassar and David Putnam have partnered with Dr. Scott Rodeo, an orthopaedic surgeon at HSS, to test new new lubricants for articular cartilage. These lubricants are polymer brushes that mimic the structure of the native lubricant on the cartilage surface and have shown the ability to prevent the progression of cartilage damage after joint injury in animals. Led by Michael Shuler and Barbara Hempstead (Hematology and Medical Oncology at Weill Cornell Medical College), the partnership between physicians and engineers was recognized with the creation of the Cornell University Center on the Microenvironment and Metastasis, a Physical Sciences Oncology Center funded by the National Cancer Institute.

Working across fields also leads to new technologies and new applications. At Cornell, one doesn't have to go far to find the diversity in expertise necessary for breakthroughs. Chris Xu (Applied & Engineering Physics, BME Field Member) and Chris Schaffer (BME)—who like to call themselves Chris[2]—have joined up with Joe Fetcho (Neurobiology and Behavior) to combine optics and neuroscience to study how running speed is controlled by spinal cord circuits. Mice run on treadmills while neural activity from their spinal cord cells is recorded by a multiphoton microscope using optical activity indicators. This would not be possible without the combination of new, record-breaking, multiphoton microscopes from the engineers and sophisticated understanding of the nervous system from neuroscientists.

MECHANICAL LINKS BETWEEN BREAST CANCER AND OBESITY

Obesity increases the risk of breast cancer, but why and whether this can be reversed is not known. Claudia Fischbach-Teschl works with a team from both Ithaca and Weill Cornell on how inflammation and poor tissue oxygenation from obesity creates an environment favorable for breast cancer cells. Fischbach-Teschl studied how fat cells interact with aspects of their environment such as signals from other cells and mechanic cues. Obesity can cause changes such as increasing the stiffness of the extracellular matrix, the scaffolding which hold cells together. Stiff environments have been shown to promote the aggressiveness of estrogen-receptor positive breast cancers. This insight on how being overweight could link to cancer came to Fischbach-Teschl when she heard a talk on inflammation in obesity from Andrew Dannenberg the Henry R. Erle, M.D., Roberts Family Professor of Medicine at Weill Cornell Medical College. A conversation led to long-lasting collaboration including a graduate student. The team expanded to include physician Cliff Hudis, Chief of the Breast Cancer Medicine Service at Memorial Sloan Kettering Cancer Center and professor of medicine at Weill Cornell who provides access to patient samples and a clinical perspective. In addition to contributing a medical perspective the Weill collaborators also helped reach out to other investigators and increase scientific exchange. "The awarded Physical Sciences Oncology Center grant solidified many of these connections and built a network of researchers that are



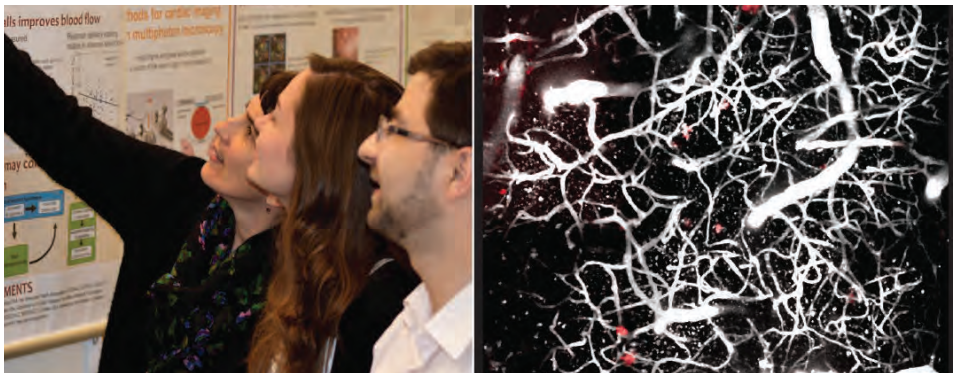
Obese mice have linearized collagen fibers (purple) surrounding large fat and inflammatory cells (green) in mammary fat tissue. In obese mice, changes in collagen structure and inflammation may facilitate mammary tumor progression.

driving cancer research in new directions." says Fischbach-Teschl.

The clinical importance and the novelty of the Fischbach-Teschl's approaches were recently recognized with the award of a $1.34 million grant from the National Cancer Institute under the "Provocative Questions" initiative. The "Provocative Questions" identified 20 aspects of cancer which are thought to be crucial for the understanding of this disease. In addition to Dannenberg and Hudis, this collaborative grant also taps into the expertise of Delphine Gourdon, (Materials Science and Engineering, BME Field Member) who works on the role of mechanobiology in disease with physics and material engineering perspectives. Gourdon and Fischbach-Teschl are another example of the productivity of interdisciplinary combinations—their complimentary expertise has resulted in five publications in the last several years. Rebecca Williams, research scientist in BME and director of Cornell's Biotechnology Resource Center Imaging Facility, rounds out the award team by providing unparalleled imaging technologies (see related story, page 5).

ENGINEERS ADDRESS ALZHEIMER'S DISEASE

Interdisciplinary collaborations also reach across the globe. A partnership between faculty from Cornell BME, Chris Schaffer and Nozomi Nishimura, Weill Cornell Medical College faculty member Costantino Iadecola, and Centre National de la Recherche Scientifique (France) faculty member Sylvie Lorthois,



(Left) Sylvie Lorthois discusses brain blood flow in Alzheimer's disease with students during a visit to the Schaffer-Nishimura labs. (Right) Multiphoton microscopy of blood vessels (white) and amyloid-beta plaques (red) in the brain of a mouse model of Alzheimer's disease.

addresses the puzzling link between Alzheimer's disease (AD) and blood flow. AD is the leading cause of dementia in the U.S. AD cost the U.S. $214 billion in 2014 and the number of patients is projected to increase as the baby boomer generation ages. Physicians have long known that blood flow in the brain is reduced in AD and cardiovascular risk factors such as high blood pressure are correlated with increased risk for developing AD, but the mechanism was not known. Curiously, the blood flow decrease occurs very early, even before cognitive signs.

This international, interdisciplinary team has uncovered a potential cause for decreased blood flow in AD and is working on strategies to mitigate the blood flow deficit. At Cornell, the Schaffer-Nishimura labs found that capillaries in the brains of mouse models of AD are occasionally plugged by white blood cells. Although it is only a very small fraction of blood vessels, Lorthois is investigating how this small number of plugged vessels can actually lead to a surprisingly large blood flow deficit in the brain tissue. Lorthois is a leading expert on fluid dynamics and models how blood cells move through the vasculature. The motion of blood cells in blood vessels is a vexingly difficult system because the cells take up about half of the volume of blood, so that commonly used models of fluid mechanics cannot explain how blood moves in the living organisms. Her findings may explain the blood flow decrease in Alzheimer patient brains. The imaging method used on mice cannot be used on humans, so although human image studies also find that there is a blood flow deficit in AD patients, there is no way to directly evaluate what is happening at the capillary level. Computational models of blood flow can be used to extrapolate the mouse results to humans. A neurologist who has long studied the effects of inflammation and blood flow regulation in the brain, Iadecola contributes clinical and molecular insight on the causes of these capillary plugs. Inflammation is a major aspect of Alzheimer's disease and collaboration has revealed several potential mechanisms that lead to the vascular insufficiency. Excitingly, because there is a link between blood flow decrease and the speed of AD progress, this collaboration may lead to a novel therapeutic target that could delay the onset of this devastating disease.

BME ADDS NEW RESEARCH AREA

Last year, the Department of Biomedical Engineering added a sixth area of specialization: systems biology. Systems biology is the integration of experimental and modeling approaches to dissect complex cellular phenomena. Fundamentally, systems biologists aim to better quantify and comprehend the highly multivariate and interactive networks of genes, proteins, and metabolites that regulate cellular function. Our faculty apply new experimental and computational approaches to understand how these transcriptional, signal transduction, and metabolic networks are regulated in healthy tissues and how they become dysregulated in pathological settings such as cancer and aging. Our researchers use modeling efforts to better engineer both novel biomolecules and new combinatorial therapeutic strategies to treat these pathophysiologies. Increasingly, our efforts aim to merge experiment and modeling at the single-cell level so as to elucidate how cell-to-cell variability arises and underlies disease progression and response to therapy. As such, we are involved in the development of sensitive approaches capable of multiplexed, quantitative measurement with single-cell resolution. These efforts rely on connections with Cornell's Nanobiotechnology Center, Center on the Microenvironmental and Metastasis (an NIH-funded Physical Sciences Oncology Center), and Stem Cell Program, as well as in collaborations with clinical and research scientists at Weill Cornell Medical College.


Ben Cosgrove

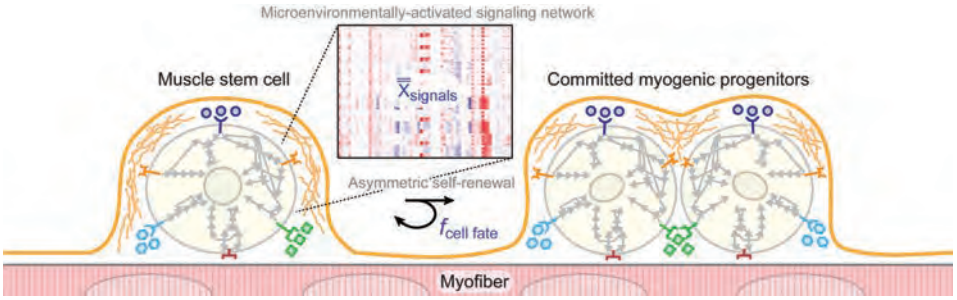
Ben Cosgrove

Ben Cosgrove's lab studies how aging influences a decline in the ability of resident stem cells to regenerate adult tissues. His lab explores how alterations in both the tissue microenvironment and cell signal transduction pathways within the stem cells themselves are altered in aging. His research uses computational and experimental approaches to better understand multivariate interactions in these signaling networks and to target aberrant network functions to rejuvenate stem cells in aged tissues.

Read more:

B.D. Cosgrove, P. M. Gilbert, E. Porpiglia, F. Mourkioti, S. P. Lee, S. Y. Corbel, M. E. Llewellyn, S. L. Delp, H. M. Blau. 2014. "Rejuvenation of the muscle stem cell population restores strength to injured aged muscles." *Nature Medicine* 20 (3): 255-264.

Cosgrove, Ben, L. G. Alexopoulos, T. Hang, B. S. Hendriks, P. K. Sorger, L. G. Griffith, D. A. Lauffenburger. 2010. "Cytokine-associated drug toxicity in human hepatocytes is associated with signaling network dysregulation." *Molec BioSyst* 6 (7): 1195-206.

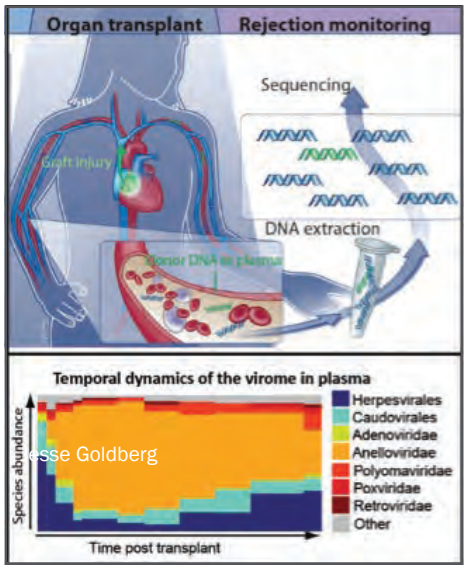


Iwijn De Vlaminck

Iwijn De Vlaminck leads an experimental physical genomics lab focused on the development and application of sensitive single-cell genome sequencing principles. Single-cell

sequencing enables highly multivariate measurements of genomic and transcriptomic cell-to-cell variability. When combined with microscopy techniques, single cell sequencing will enable the study of the systems biology of cells in tissue microenvironments.

The De Vlaminck lab uses high throughput sequencers as molecular counters of circulating cell-free DNA to diagnose infection and rejection in organ transplantation. Top: A transplant can be thought of as a genome transplant, since each cell in the donor organ has a different genome than the recipient. Cell death in the graft consequently leads to the release of DNA that can be discriminated from recipient DNA via genomic analyses. Bottom: representation of different viral families in plasma of heart and lung transplant recipients as function of time after transplantation.



Read more:

De Vlaminck, Iwijn, Hannah A. Valentine, Thomas M. Snyder, Calvin Strehl, Cohen Garrett, Helen Luikart, Norma E. Neff, Jennifer Okamoto, Daniel Bernstein, Dana Weisshaar, Stephen R. Quake, Kiran K Khush. 2014. "Quantification of circulating donor-specific cell-free DNA for detection of heart transplant injury." *Science Transitional Medicine* 6 (241ra77).

Bourcy, Charles de, Iwijn De Vlaminck, Jianbin Wang, Jad Kanbar, Charles Gawad, Stephen R. Quake. 2014. "Quantitative Comparison of Single-Cell Whole Genome Amplification Methods." *PLOS ONE* 9 (e105585).

FIELD FACULTY

Jesse Goldberg

Jesse Goldberg is an assistant professor in the department of Neurobiology and Behavior. His lab is interested in how systems of interconnected brain regions interact to control behavior.

Julius Lucks

Julius Lucks is a James C. and Rebecca Q. Morgan Sesquicentennial Faculty Fellow in the department of Chemical and Biomolecular Engineering. His lab is interested in the bottom-up design and construction of sophisticated genetic systems with predictable function.

Jason Locasale

Jason Locasale is an assistant professor in the department of Nutritional Science. His lab focuses on an integrated understanding of metabolism in health and disease.

Jeffrey Varner

Jeffrey Varner is an associate professor in the department of Chemical and Biomolecular Engineering. His research focuses on the development of physiochemical modeling tools that can be used to rationally "reprogram" signal flow in human signal transduction networks.

LONG-AWAITED BIOMEDICAL ENGINEERING MAJOR GETS THE GREEN LIGHT

Cornell University has received state approval to offer a long-awaited undergraduate major in biomedical engineering (BME) and will begin taking sophomores into the program this fall.

"This has been part of the conversation since Cornell Engineering's BME department started," said Larry Bonassar, professor of Biomedical Engineering and an original member of the department, which was created a decade ago and currently offers master's of engineering and Ph.D. degrees and an undergraduate minor.

The College of Engineering also just announced a $50 million gift to expand the BME department into a school named the Nancy E. and Peter C. Meinig School of Biomedical Engineering.

"The Meinigs' gift will give the new school significant resources as we launch the new major," said Marjolein van der Meulen, the Swanson Professor and the James M. and Marsha McCormick Chair of Biomedical Engineering. "Launching our biomedical engineering undergraduate major is an initiative our faculty have been working on for a long time, and an opportunity our students have been eagerly anticipating," van der Meulen said.

"College administrators and faculty have known that many engineering students would have majored in BME if they could have the option available," Bonassar said. A survey of the incoming Engineering freshman class indicated that 60 percent of the students had an interest in biological applications of engineering.

"This major allows Cornell Engineering to attract creative and intelligent prospective students who are interested in biomedical engineering," explained Jonathan Butcher, associate professor of Biomedical Engineering, associate department chair and director of undergraduate studies for the department. For the Class of 2019, 12 percent of incoming freshman engineers have indicated BME would be their top choice.

"Our college's particular strengths in BME fit well into Cornell's collaborative culture and accentuate our collaborations with the College of Veterinary Medicine and Weill Cornell Medical College," said van der Meulen.

Biomedical engineering builds research around a quantitative understanding of the human body as an integrated, multiscale system. The study of mechanisms of disease through engineering analysis can be used to design better therapies, devices and diagnostic procedures to improve human health.

Unlike graduates of many traditional

Associate Professor Cynthia Reinhart-King

Shivaun Archer, John and Janet Swanson Senior Lecturer, with undergraduate students at a BME poster session in the Weill Hall atrium.

engineering fields, BME graduates must be able to thrive in an environment of variability and think through problems in which the assumptions are poorly defined, Butcher said. For example, a piece of steel has very consistent values for its strength, elasticity and other properties, while in biology, 10 samples of the same type of ligament can be tested and generate 10 different results. "How do you make a product that works robustly and accommodates biological variability?" he asked.

The BME major at Cornell will include a core curriculum with options for four concentrations: biomaterials and drug delivery; instrumentation and imaging; biomechanics; and molecular, cellular and tissue engineering. Application- and concept-driven courses will be integrated from the beginning and will maintain a strong presence throughout the four-year program.

"Engineering education research shows that students are more motivated and perform better when they can see the applications of what they're doing up front," Bonassar said. "For BME students, applications to human health will always be there, to connect them to real-world problems…increasing both interest and retention in the long term."

Other notable parts of the undergraduate major will include senior capstone labs to complement capstone design courses.

Bonassar said the new major also has the potential to significantly shift the college's demographics: the College of Engineering incoming freshman class is 48 percent female—a historic peak for the college, he said—and of the recent survey of students who listed the BME major as their top choice, nearly 70 percent were women.

"We have worked for over 10 years to build a department with the diversity of expertise and number of faculty to successfully launch an undergraduate program," said Mike Shuler, the Samuel B. Eckert Professor of Engineering who was the founding James and Marsha McCormick Chair of BME for 10 years. "I am pleased that we have reached that milestone and expect Cornell to become a leader in undergraduate BME education."

GIFT TO TRANSFORM BIOMEDICAL ENGINEERING

$50M GIFT CREATES MEINIG SCHOOL OF BIOMEDICAL ENGINEERING

A decade after its creation, Cornell's Department of Biomedical Engineering has received a $50 million endowment gift that will expand and elevate it as the Nancy E. and Peter C. Meinig School of Biomedical Engineering. Representing the largest single philanthropic commitment by individual donors to one of the university's colleges in Ithaca, the gift is made by Nancy Meinig '62 and Peter Meinig '61, along with daughters Anne '87, Kathryn, M.B.A. '93, and Sarah, and their own families.

"This is a pivotal moment for Engineering at Cornell," said Lance Collins, the Joseph Silbert Dean. "The Meinig family's gift is a game changer, in terms of both its size and the effect it will have. To provide some historical context, the college's only other named school is the Sibley School of Mechanical and Aerospace Engineering, which traces its roots to the 1800s."

According to Collins, the establishment of the Meinig School is happening at "exactly the right time in the evolution of biomedical engineering at the university." The BME program is the centerpiece of Cornell Engineering's new strategic push to advance the wider multidisciplinary field of bioengineering, which impacts the university broadly, from Engineering and the College of Veterinary Medicine in Ithaca to Weill Cornell Medical College and Cornell Tech in New York City.

2014 Trustee Council Annual Meeting (TCAM) Weekend: Trustees Nancy and Peter Meinig at the Sesquicentennial Grove Dedication.

Former President David J. Skorton lauded the Meinig family's many contributions to Cornell over the decades and pointed to BME's ability to strengthen connections among schools and campuses. "This gift is an incredible continuation of the Meinig family's generosity to Cornell and will strengthen the university in countless ways, not the least of which is by enhancing research synergies between Ithaca and Weill Cornell," he said. "By its very nature, biomedical engineering bridges medicine, engineering and the basic sciences while addressing some of the most daunting health issues of our time. There is no more important investment the Meinigs could make."

Cornell President Elizabeth Garrett added: "The Meinigs—individually, as a couple and as a family—have made a tremendous difference in so many areas for Cornell. Their new gift sets us on a course for increased impact in biomedical engineering and the convergent biosciences, an interdisciplinary effort that will drive advances in health and well-being over the next decades. The Meinig School will be a powerhouse of

teaching and research with consequences for generations to come."

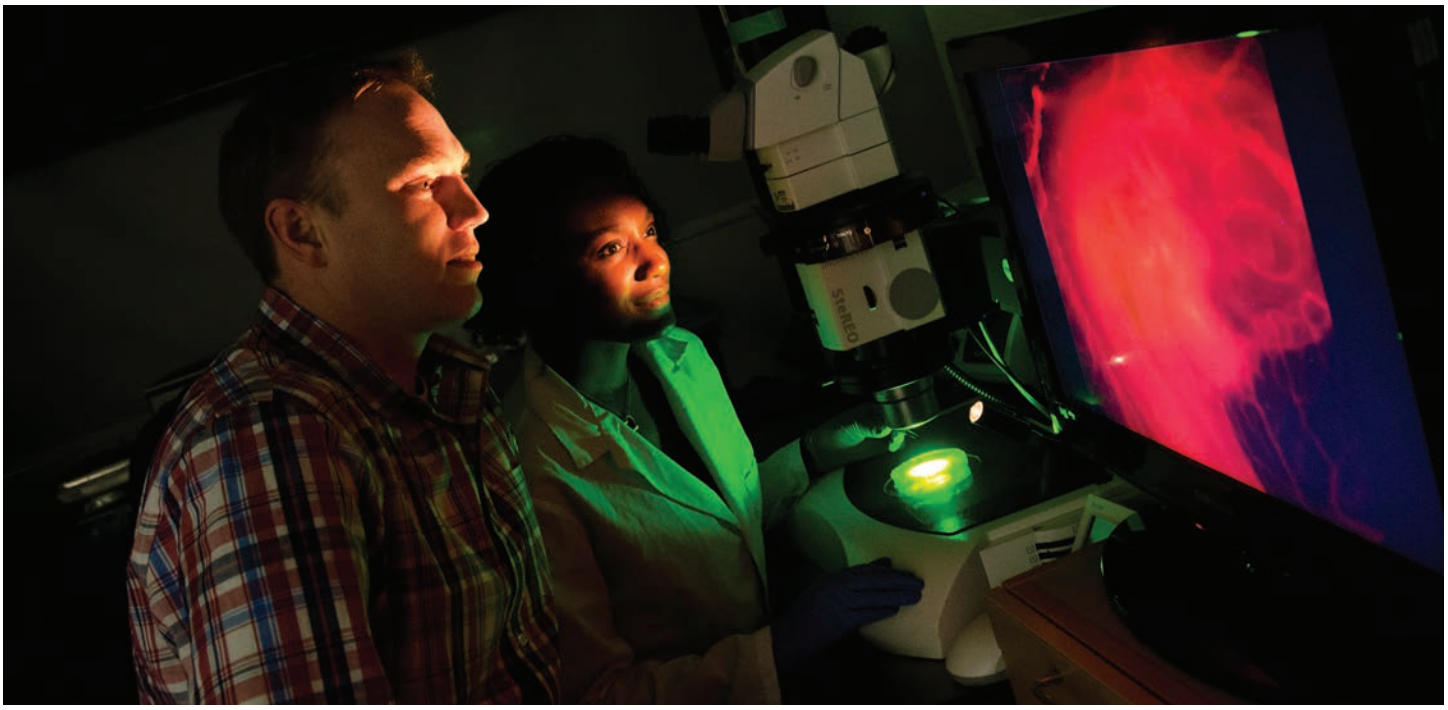
Marjolein van der Meulen, the James M. and Marsha McCormick Chair of Biomedical Engineering and the Swanson Professor of Biomedical Engineering, added that the Meinig School is especially timely in light of New York state's recent approval of the Biomedical Engineering undergraduate major.

"As we launch the major in the fall and develop the undergraduate BME program, this transformational gift will provide resources that we previously could only dream about for hiring faculty, recruiting graduate students, and supporting teaching and research excellence," van der Meulen said. Some of that research includes BME's innovations and cross-campus collaborations in the diagnosis and treatment of a range of complex illnesses, including cancer, Alzheimer's, diabetes, and cardiovascular disease.

The gift was borne out of the Meinigs' long and close relationship with Cornell and their engagement in several university milestones. Peter Meinig is chairman emeritus of the Cornell Board of Trustees, and he and Nancy Meinig are both presidential councillors and co-chairs of the university's sesquicentennial committee. "The stars were all aligned for us," said Nancy Meinig, referring to the couple's energizing experience with the sesquicentennial celebrations across the nation and in London and Hong Kong and their desire to contribute even further to the university's current capital campaign, which is nearing the $6 billion mark. Their gift also is inspired by Peter Meinig's growing involvement with Cornell Engineering, where he has been partnering with the dean to help guide and articulate the college's future strategic direction.

"A big part of why we made this gift is to motivate other people to make gifts to BME, Engineering and Cornell, large or small," Peter Meinig added. "There are many great opportunities to support and engage with the university."

Supporting Cornell is truly a family affair, according to daughter Kathryn, executive director of the Meinig Family Foundation whose focus is on youth, education and the arts. "Ever since my parents established the foundation, it was very important for all of us to be involved," she said. "My two sisters and I are all trustees, and we are trying to instill in the next generation a sense of service and the obligation we all have to give back."



Prof. Jonathan Butcher in his lab with doctoral candidate Stephanie Lindsey.

M.ENG. PROGRAM DIRECTOR NEWTON DE FARIA


Newton de Faria

The Department of Biomedical Engineering is pleased to announce that Dr. Newton de Faria joined our faculty as the Master of Engineering Program Director, beginning June 16th. Dr. de Faria earned his Ph.D. in Biomedical Engineering from the University of Texas at Austin in 1998. He brings nearly two decades of experience working in industry and has held numerous teaching appointments. For the last decade he has focused on medical devices, analytical devices and pharmaceutical application markets in the biomedical and health industries. Recently, he has worked as the senior district sales manager and strategic accounts manager for National Instruments Corporation. He has taught BME 6500, Biomedical Instrumentation, at the University of Connecticut.

BME M.ENG. PROGRAM

Cornell's Master of Engineering (M.Eng.) programs focus on engineering practice and design. Our goal is to prepare students for professional practice in BME. For outstanding students who are interested in entrepreneurship and engineering, Cornell University offers a combined M.B.A./M.Eng. program. Our M.Eng. students acquire a broad perspective of the biomedical engineering discipline that complements their undergraduate training in engineering or science, and an in-depth knowledge of an essential area in biomedical engineering. In addition to coursework, students complete a collaborative design project. Graduates are equipped to design biomedical devices and develop therapeutic strategies within the bounds of health care economics, the needs of patients and physicians, the regulatory environment for medical devices and pharmaceuticals, and stringent ethical standards of biomedical engineering practice. Our M.Eng. program incorporates industry-oriented training using a design centric approach to prepare students for a wide range of careers in medicine, academia, and industry from large pharmaceutical firms to entrepreneurial startups.

ILANA BRITO PROFESSOR


Ilana Brito

Professor Ilana Brito will join BME as an assistant professor in July 2016. Her main research interests involve understanding how microbes (and their genes) are transmitted among individuals and between individuals and their environments. This extends not only to pathogens but also to the commensal organisms that inhabit different human body sites. To this end, she launched the Fiji Community Microbiome Project, which surveyed 300 individuals living in small village communities in the Fiji Islands about family and social networks, lifestyle and health history. Brito also retrieved microbiome samples from body sites most exposed to endogenous bacteria and the environments in which they live. She combined single-cell genomics, metagenomics and 16S surveys to investigate some of the major differences between these microbiomes and those in the Human Microbiome Project. Understanding the dynamics and factors that govern endogenous bacterial transmission will enhance epidemiological knowledge and expand our capacity to use bacteria therapeutically. Coined as the "The Biologist Who Flew to Fiji for Feces," by OZY, Brito is noted as a risk-taking, rising star.

M.ENG. STUDENTS SHADOW CLINICIANS IN NEW IMMERSION COURSE

Interacting with clinicians is critical to the success of biomedical engineers. To prepare BME Master of Engineering (M.Eng.) students for these future interactions Cornell BME previously piloted single-day and week-long clinical immersion experiences. This year a clinical mentorship course was created to provide a more extensive clinical experience with a single dedicated clinician. The mentorship provides a one-on-one interaction with clinicians for an extended period of time to understand their needs and relate the knowledge gained in the classroom to clinical questions.

Led by Robert R. Karpman, M.D., M.B.A., an adjunct professor in the department, clinician mentors were drawn from the surrounding community including Guthrie Clinic, Cayuga Medical Center and Cortland Regional Medical Center. Mentors were enlisted who were experienced in teaching students and interested in helping M.Eng. students understand the clinical applications of the student's present and future work. Areas of specialty included minimally invasive surgery, cardiology and cardiovascular surgery, orthopedics, physical therapy, ENT, neonatology, pulmonology, plastic surgery, and neurosurgery.

M.Eng. students spent at least 4 hours per week with a clinician mentor experiencing their daily clinical practice directly. Students also participated in a weekly seminar with Dr. Karpman to discuss their experiences and to relate their understanding of the anatomy, physiology and pathology of disease to their engineering perspective. Upon completion of the mentorship, students submitted a basic design of a new device that would assist their mentor to provide a more efficient or improved quality of care to their patients in the future.

Based on the success of this program this spring, methods to include more students next year are being considered including offering the mentorship both semesters. The Guthrie Clinic staff enthusiastically supports the development of a poster session at the end of the year to allow all medical staff to see what the students have developed during their mentorship. The mentorship will be offered as a full semester 2-credit course called BME 5100 Clinical Preceptorship for Biomedical Engineers starting this Fall 2015.

The interaction between clinicians and students is an extremely valuable part of the M.Eng. learning experience. Hands-on clinical training prepares students for professional practice in BME and provides a unique skill set for Cornell BME graduates.

Melissa Mansfield, M.Eng. '15, with mentor Dr. Choi, shoulder surgeon at Guthrie Robert Packer Hospital.

NEW M.ENG COURSES

BME PILOTS ENTREPRENEURSHIP COURSE

Last year, the Department of Biomedical Engineering piloted a course to introduce graduate students, mostly from STEM backgrounds, to basic business and managerial principles.

The course entailed an intense seven-week immersion led by Robert R. Karpman, M.D., M.B.A. an adjunct in the department as well as Entrepreneur-In-Residence at Cornell for biomedical technology and health care. With the help of the Broadening Experiences in Scientific Training (BEST) program and Entrepreneurship at Cornell, Karpman taught four sessions of BME 5950: Business as a Second Language: From Molecules to Moola! 53 students, mostly from STEM backgrounds, participated in one of the 4 sessions. Business as a Second Language covered a wide variety of topics including: financial statements, managerial accounting, time value of money, marketing, budget preparation, developing a business plan, micro and macroeconomics, leadership, negotiation, project development and self-management. The final examination consisted of group "pitches" of a virtual technology to develop a start-up business.

Student testimonials attested to the effectiveness of the course as a primer for future studies and work in industry. One student noted that the course offered "a broad spectrum overview of key topics in business," which helped guide and inspire further research into "specific topics of interest." Another reported that the "knowledge gained in this class is sure to set [students] apart during the job search process" and further career goals. Based on positive feedback, this course will be offered in Fall 2015 as a 3-credit leadership course called BME 5960: Business and Management Fundamentals for Biomedical Engineers.

Robert Karpman, M.D., M.B.A.

FACULTY AWARDS & HONORS

CORE FACULTY

Lawrence Bonassar

Lawrence Bonassar, professor, was elected to serve on the Board of Directors of the International Society of Biofabrication, a professional society dedicated to promoting the growth of biofabrication research, development, education, training, and medical and clinical applications. As 1 of 10 members, Professor Bonassar will serve an important role in influencing the direction of this exciting field in the future.

Ben Cosgrove

Ben Cosgrove, assistant professor, won a "Rising Star" Award at the BMES-CMBE annual conference. Rising Star awardees designate exceptional junior principal investigators and are selected to present a short podium presentation.

Claudia Fischbach-Teschl

Claudia Fischbach-Teschl, associate professor, was an Emerging Leaders Lecturer in the Department of Chemical Engineering and Applied Chemistry at the University of Toronto.

FACULTY AWARDS & HONORS

Michael King

Michael King, professor, has been elected to the Biomedical Engineering Society Class of 2015 Fellows. He'll be recognized at the BMES Annual Meeting on Oct. 7-10 in Tampa, Florida.

David Lipson

David Lipson, senior lecturer, was issued a new patent for methods, devices, and kits devised to magnetically control eyelid position.

Nozomi Nishimura

Nozomi Nishimura, assistant professor, received a prestigious NSF Young Investigator CAREER Award. Her proposal, "Aberrant rewiring of neurons after injury," will study the effect of non-neural cells on the connections between neurons during inflammation and injury of the brain in vivo.

Cynthia Reinhart-King

Cynthia Reinhart-King, associate professor, received the 2015 Zellman Warhaft Commitment to Diversity Award from the College of Engineering in recognition for her efforts to increase participation of underrepresented students in engineering.

Chris Schaffer

Chris Schaffer, associate professor and director of graduate studies, received the James M. and Marsha D. McCormick Award for Outstanding Advising of First-Year Engineering Students, the highest honor for advising awarded by Cornell Engineering.

Marjolein van der Meulen

Marjolein van der Meulen, James M. and Marsha McCormick Chair of Biomedical Engineering and Swanson Professor of Biomedical Engineering, was named a 2014 fellow of the American Association for the Advancement of Science (AAAS), the world's largest general scientific society and publisher of the journal *Science*.

She also received the Orthopaedic Research Society's Women's Leadership Award. This annual award recognizes a woman biologist, clinician, or engineer who, throughout her professional lifetime, has demonstrated outstanding leadership and service as well as made significant contributions to the understanding of the musculoskeletal system and musculoskeletal diseases and injuries.

FIELD FACULTY

Harold Craighead, Charles W. Lake, Jr. Professor of Engineering, was inducted into the National Academy of Inventors. NAI selects fellows based on their excellence in academic invention.

Susan Daniel, assistant professor, was awarded a 2015 Cook Award for her contributions to improving the culture for graduate women in chemical engineering.

Eve Donnelly, assistant professor, received a prestigious NSF Young Investigator CAREER Award for her proposal, "Role of Variations in Tissue Material Properties in Bone Fracture Behavior."

Julius Lucks, assistant professor, received a prestigious NSF Young Investigator CAREER Award. Lucks' NSF Career proposal, titled 'Uncovering Quantitative Design Principles of RNA Regulators for Synthetic Biology,' aims to pioneer quantitative, multi-level design principles for RNA structure/function relationships.

Dan Luo, professor, was appointed a senior editor of the *Journal of Interdisciplinary Nanomedicine*, an associate editor of *Synthetic and Systems Biotechnology*, and to the editorial board of *Nano Research*. He also received the Cornell Outstanding Educator Award for having most influenced a Merrill Presidential Scholar.

Al Molnar, associate professor, was selected by the College of Engineering to receive the Kenneth A. Goldman '71 Excellence in Teaching Award.

Gregory Petsko, Arthur J. Mahon Professor of Neurology and Neuroscience and director of the Helen and Robert Appel Alzheimer's Disease Research Institute, is the president-elect of the Harvey Society.

Ankur Singh, assistant professor, is among 13 outstanding U.S. scientists recently recognized as 2014 Young Innovators in Cellular and Molecular Bioengineering.

Melissa Warden, assistant professor, received an Alfred P. Sloan Research Fellowship and a Whitehall Foundation Research Grant.

CORNELL BMES HOLDS GIRL SCOUT ENGINEERING DAY

Cornell BMES Chapter

Last February, Cornell's BMES chapter held its third annual Girl Scout Engineering Day to inspire young women to pursue careers and study in STEM disciplines. Over 100 Girl Scouts from grades 2-10 traveled to the Cornell campus from all over New York and Pennsylvania to participate in the program. Participants learned about different types of engineering through hands-on activities. The girls worked in teams to design and create devices such as marble roller coasters, circuits made from Play-Doh® and gumdrop towers. Registration was maxed out for the event, demonstrating the reputation that this event has made over the past three years. This annual event is a highlight for the BME department outreach committee, and will continue to run and motivate more young women each year.

NISHIMURA LAB HOSTS HIGH SCHOOL STUDENTS

The Nishimura Lab hosted nearly fifty high school students this summer as part of Cornell Engineering's CATALYST Academy. The CATALYST Academy is a selective one-week summer residential program that enables high school students from all over the country to gain valuable insight into engineering research. The program aims to promote interest within the engineering field by exposing high school students to classes, lab sessions, and research at Cornell University. This year, the Nishimura lab with students in the Schaffer lab and visiting veterinary students in the Leadership Program for Veterinary Scholars, came up with the program theme: "Beyond the Image."

Throughout the week, the students rotated through modules planned by members of the Schaffer-Nishimura labs, all of which investigated the idea of an image as a powerful tool for scientists and engineers. Students learned about many aspects of imaging from neuroscience, to optics, to image analysis and cutting-edge research. Academy participants experimented with using images as data to better understand the world around them. They combined multiple fields of study—biology, physics, engineering, and math—into activities among which included modeling an eye, performing histology, imaging in vivo in mice, building a microscope, as well as exploring Beer's Law. During each module, students were aided by undergraduate researchers in the lab who encouraged and inspired scientific exploration and discovery.

—Heley Ong and Karen Lin

CATALYST Academy students examine samples under microscopes they built with their smartphones

BME IN RESIDENCE

Even before Biomedical Engineering established an undergraduate major earlier this summer, the department had made undergraduate education a priority. Several BME faculty were already immersed in undergraduate life through Cornell's "Learning Where You Live" residential initiative. Since August of last year, BME professors Chris Schaffer and Nozomi Nishimura have been faculty-in-residence (FIR) in Mary Donlon Hall, a first-year dorm with ~480 students. Professor Chris Hernandez is a FIR in the townhouses on North Campus. Every morning, the three faculty join thousands of first-year students on the walk from North Campus, across the gorge to their classrooms and research buildings.

In the evening, the FIRs join students for dinner to chat and provide informal mentoring. They also organize intellectual, social, and cultural programs, including two new innovative, one-credit courses offered to first-year students. Nishimura taught BME 1120: Sautéed Science and Engineered Edibles, a class that brought about 10 students into Schaffer and Nishimura's kitchen to explore the science of food preparation and to learn about scientific exploration and discovery. Schaffer offered BME 1110: Seeing Science in Action, a course in which students learn about the broad research goals of a lab and then shadow scientists conducting that research. In describing the impact of this course, Schaffer said it helped familiarize students with research: "For 15 of the 16 students in the course, this was their first time stepping foot into a research laboratory. By the end of the course, they had seen the inside workings of three different labs and had a much better perspective on what it is like to be a scientist and how science gets done."

Prof. Chris Hernandez (BME and MAE, middle) and Prof. Lorraine Maxwell (Design and Environmental Analysis, right) chat with first-years at the Fall Holiday Faculty in Residence Reception at the Townhouses.

At the townhouses, Prof. Hernandez hosts social and educational programs twice per month. These programs not only showcase science and engineering, but also offer a taste of Cornell's multicultural riches. Hernandez's programs include a monthly reception featuring foods from around the world and faculty from across campus and disciplines. Key events include the annual "Spicy Chocolate" dinner, "Ethiopian Coffee," and an afternoon of 3D printing. Through these social opportunities with Hernandez and his Faculty Fellow colleagues, multiple students have gotten involved in research. Some have joined laboratories in BME (including Hernandez's lab).

Chris Schaffer, director of graduate studies, mans a lemonade stand during move-in weekend

Additional BME faculty get to know students through the Faculty Fellow program, a companion to the FIR initiative. Faculty Fellows don't live in the dorms, but interact with residents by hosting programs and social events there. Xiling Shen, a fellow with the townhouses, says his most well-attended event is making bubble tea. In addition to being department chair, Marjolein van der Meulen is often seen with upperclassmen at Alice Cook House where she is a Faculty Fellow.

BME graduate students are also very active with undergraduates, with many serving as graduate residence fellows (GRFs). These highly-competitive positions are about more than maintaining discipline in the dorms, they promote intellectual and cultural enrichment. They are mentors and friends with the undergraduates. Elizabeth Wayne, a GRF at Bethe House, says she is asked frequently about being a BME Ph.D. student. "Students often want to talk about how to get into graduate school, what my daily life is like as a Ph.D. student, and about the research that happens in my lab." Poornima Gadamsetty, who has served as a GRF at both Flora Rose and Mary Donlon halls, says her experience as a GRF has been enriching not just for the undergrads, but for herself as well. "It's interesting how many times I gave them career advice and got back advice on fun classes and alternative careers." Current graduate students also serving as GRFs are Darvin Griffin, Olufunmilayo (Funmi) Adebayo, Jose Rios, Elizabeth Feeney, and Jean C. Cruz Hernandez.

ALUMNI

Michael Campolongo, Ph.D. 2012

Michael graduated in 2012 with a Ph.D. in Biomedical Engineering. He is currently working as a patent agent at Lowenstein Sandler LLP, a New Jersey law firm, where he works to procure patents for large corporate clients and start-up companies in a variety of industries, including software, catalysts, medical devices, nanotechnology, and biomaterials. Michael is also concurrently pursuing a law degree at Seton Hall University in Newark, New Jersey.

Jason Gleghorn, Ph.D. 2008

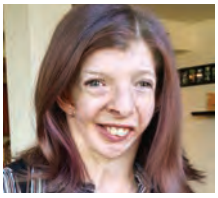
After graduating in 2008, Jason Gleghorn worked as a postdoctoral fellow with Prof. Brian Kirby in the Sibley School of Mechanical and Aerospace Engineering at Cornell. During that time, he developed the GEDI microfluidic platform for the capture, enumeration, and analysis of circulating tumor cells. He then transitioned to Princeton to work with Prof. Celeste Nelson in the department of Chemical and Biological Engineering. His second postdoctoral fellowship in molecular and developmental biology combined his expertise in microfluidics from his Ph.D. work with Prof. Larry Bonassar in soft tissue mechanics to investigate the mechanical regulators of lung development. Jason joined the Biomedical Engineering faculty at the University of Delaware in the fall of 2014. His lab uses microfluidic and microfabrication technologies to determine how cells behave and communicate within multicellular populations to form complex 3D tissues and organs. He was recently awarded the Ralph E. Powe Junior Faculty Enhancement Award for his work in understanding the biophysical and molecular regulators of organ morphogenesis in the mouse embryo. Overall, he seeks to combine the powerful 3D culture tools he has developed with his morphodynamic studies in the embryo to define new therapeutic approaches for regenerative medicine and cancer.

John Huynh, Ph.D. 2012

John Huynh completed his Ph.D. under the supervision of Professor Cynthia Reinhart-King in the fall of 2012. While at Cornell, his research focused on understanding the effects of vascular aging and stiffening on the progression of atherosclerosis, a disease in which blood vessels thicken due to plaque build-up. Since graduating, John joined the Vaccine Process Development and Commercialization group at Merck & Co. His primary responsibilities in this role were to optimize vaccine production processes to ensure the safety, efficacy, and quality of Merck vaccines. After performing research on the vaccine manufacturing process for rotavirus, John became the development lead for the measles, mumps, and rubella (MMR) franchise. Today he leads and mentors a team of scientists whose ultimate goal is to deliver life-saving vaccines to the children who need it most. Additionally, John co-leads process development efforts for the new VSV-EBOV vaccine against Ebola. As Merck's recruiting team captain for Cornell, he looks forward to revisiting campus to meet the new wave of talented BME students.

Schinthia Islam, M.Eng. 2011

Schinthia Islam worked in the Butcher lab on gene delivery into aortic valve cells before graduating with an M.Eng. degree in 2011. Though Schinthia remembers finding herself at Cornell BME a bit unexpectedly, she is grateful for her time there and has fond memories of the corridors of Weill Hall. After graduating , she traveled the East Coast and then returned to her home state, Nevada, where she met Abdulhalim, her partner in crime and the love of her life. In 2012, they married, and a few days after, Schinthia joined HeartFlow, Inc., an innovative biomedical device company in California that provides a diagnostic tool for cardiovascular disease using CT heart data to produce a 3-D models of the coronary arteries. As a case analyst for the company, Schinthia produced the 3-D models. She took a short break from HeartFlow to live in Tennessee. Currently, Schinthia is back in California at HeartFlow training new analysts. In 2014, Schinthia and Abdulhalim welcomed a son, Al-Ameen, who is now a spunky and inquisitive one-and-a-half-year-old.



Casey Kraning-Rush, Ph.D. 2013

After graduating from the BME Ph.D. program in 2013,

Casey enrolled in the law school at the University of Pennsylvania in Philadelphia to pursue a career in intellectual property law. She became involved with the Penn Intellectual Property Group (PIPG), and was selected as an associate editor for their blog (http://pennip.org). The next year she became managing editor, supervising four new associate editors. While at Penn Law, she also began working with the Penn Law Students for Reproductive Justice, a pro bono group that promotes reproductive rights for women by promoting access to safe, comprehensive, and affordable reproductive healthcare. The organization collaborates with the Women's Law Project, the Public Defender's Office, Planned Parenthood, and the Philadelphia Women's Center. Casey received an offer for a summer associate position at the Delaware office of Fish & Richardson during her 1L summer. Fish & Richardson is a global patent, intellectual property litigation, and commercial litigation law firm founded in 1878, currently employing over 400 attorneys and technical specialists (including two other Cornell BME alums, Natalie Galley and Richard Wong). Fish & Richardson is routinely named one of the top patent firms in the country, and handles more patent litigation cases than any other firm. Casey is currently spending her second summer there, and could not be happier. She works with an amazing team of intelligent, capable, and kind individuals, and is looking forward to what this next chapter of her life will bring!

Michael Mitchell, Ph.D. 2014

Dr. Michael J. Mitchell received his Ph.D. in Biomedical Engineering in 2014. Under the supervision of Prof. Michael King at Cornell, he developed a therapeutic approach to target and kill circulating tumor cells in the bloodstream to prevent metastatic tumor formation. Circulating white blood cells are utilized to display the cancer-specific TNF-related apoptosis inducing ligand (TRAIL) and the E-selectin adhesion receptor. The results were reported in the Proceedings of National Academy of Sciences, and gained national and international attention from over 100 different news organizations. His doctoral research was recognized internationally through awards from the Biomedical Engineering Society, International Society of Biorheology, American Institute of Chemical Engineers, and Society for Biomaterials. Currently, Michael is an NIH-National Cancer Institute Ruth L. Kirschstein Postdoctoral Fellow in the department of Chemical Engineering at the David H. Koch Institute for Integrative Cancer Research at MIT, supervised by Prof. Robert Langer. In Langer's lab, Michael is developing new strategies to deliver therapeutics to the bone marrow microenvironment. Specifically, he has identified polymeric nanoparticle platforms that, for the first time, enable potent gene delivery to bone marrow endothelium and hematopoietic stem cells in vivo. These platforms are currently being investigated for the prevention of breast and prostate cancer metastasis to bone, the treatment of multiple myeloma, and to increase the therapeutic efficacy of bone marrow stem cell transplantations. In addition to the Ruth L. Kirschstein Postdoctoral Fellowship, his research has been recognized with a Cellular and Molecular Bioengineering Postdoctoral Research Award from the Biomedical Engineering Society.

Diego Rey, Ph.D. 2010

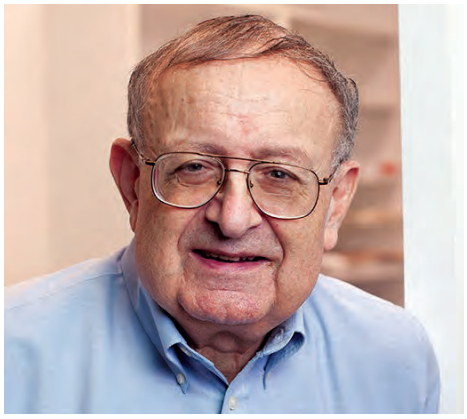
Diego Rey conducted his Ph.D. work in Prof. Carl Batt's lab, where he developed novel strategies for biofunctionalization of nanomaterials and exploring their potential as cancer imaging agents and therapeutics. At Cornell he benefited from a highly interdisciplinary research environment with exposure to basic research, clinical applications, and entrepreneurial activities. Diego says Prof. Batt's diverse research programs provided his students with a uniquely enriching graduate experience and a launchpad for future endeavors. While at Cornell, Diego co-founded GeneWEAVE, Inc., along with Leonardo Teixeira (Ph.D. 2009, Microbiology) and Jason Springs (M.B.A. 2009). The insight for starting GeneWEAVE came from Diego's exposure to various nucleic acid detection tools and techniques, all of which suffered from stringent sample preparation requirements that limited their utility. GeneWEAVE went on to commercialize a platform technology that enables the development of in vitro diagnostics for detecting bacteria and their antimicrobial susceptibility without the need for sample preparation. After Cornell, Diego continued his role as GeneWEAVE's chief technology officer as the company raised venture capital investment and grew to 50 employees. In August 2015, Roche acquired GeneWEAVE, making the company a division of Roche Molecular Diagnostics. Diego currently serves as head of research there, where he continues to develop simple-to-use and cost effective diagnostics with the goal of reducing infections worldwide caused by multidrug-resistant organisms.

FACULTY RETIREMENTS

DAVID LIPSON

As one of the founding members of the M.Eng. program, David Lipson's ingenuity and enthusiasm were fundamental in establishing one of the leading BME M.Eng. programs in the nation. Dr. Lipson completed his undergraduate degree in Electrical Engineering at Cornell in 1973. He went on to earn both his M.S. and Ph.D. in Biomedical Engineering from Case Western University before returned to Cornell in 2004 to act as Senior Lecturer and help build the Master of Engineering program. Dr. Lipson helped grow the M.Eng. program from a dozen students to over 90 per year. He specialized in both BME 5500: Medical Product Development Engineering and BME 4020: Medical Physiology. Dr. Lipson taught students in an interactive environment and prepared them for professional practice by bringing in guest lecturers from the industry to lead real-world simulations of engineering situations. His capacity for connecting students to clinicians and industry was unique. Under his leadership, students addressed a tremendous variety of biomedical problems ranging across applications in research labs, patient homes, clinical industry and global health.

When asked about his time at Cornell, he said that he "will terribly miss learning students' stories and helping them find jobs." He went on to say "It was an honor to be part of the BME faculty and help make the M.Eng. program be both competitive and number one in the country." We thank him for his dedication to building the BME M.Eng. program and enriching the lives of both faculty and students during his time here at Cornell.



JONATHAN BLACK

Jonathan Black brought the engineering behind orthopedic implants to life for students in BME. One of the pioneers in the field of biomaterials for orthopedic applications, Prof. Black's years of real-world experience in engineering for patient needs was a source of insight and inspiration. During his time at Cornell, Prof. Black lead design team projects in orthopedic and biomaterials applications. His experience in both academia and industry enabled him to guide several of these Cornell M.Eng. projects to evolve into new companies. He encouraged students completing their Biomedical Engineering M.Eng. degree at Cornell to think on their own and have the confidence and freedom to come up with their own conclusions.

Prof. Black has been a researcher in several areas of Biomaterials, written many articles and several textbooks, served on several advisory and editorial boards, and was assistant editor of the *Journal of Biomedical Materials Research* from 1978-1995. Prof. Black received his bachelor's degree in Physics from Cornell University in 1961 and his Ph.D. in Metallurgy and Materials Science from the University of Pennsylvania in 1972. Prof. Black is currently the Hunter Professor Emeritus of Bioengineering at Clemson University. He returned to Cornell as an adjunct professor of Biomedical Engineering from 2011-2015. We thank him for his contribution to the development of Cornell's M.Eng. program in Biomedical Engineering and the numerous design teams he supervised during his career at Cornell.

STUDENT & POSTDOC AWARDS

Francois Bordeleau, a post-doctoral associate in the Reinhart-King Lab, received a Reviewer's Choice Award for his abstract at the annual BMES Meeting in 2014.

Shawn Carey, a seventh year Ph.D. candidate in the Reinhart-King lab, paper in AJP-Cell Physiology was selected for APSselect, "a collection from the APS that showcases some of the best recently published articles in physiological research."

Shoshana Das, an undergraduate student in the Butcher lab, won a Goldwater scholarship, the premier undergraduate award in mathematics, the natural sciences, and engineering.

Alexey Dimov's, a fourth year Ph.D. student in the Wang Lab, article, "Joint estimation of chemical shift and quantitative susceptibility mapping (chemical QSM)," was featured on the cover of "*Magnetic Resonance in Medicine*" journal, best technical MRI journal.

Emily Farrar, a fifth year Ph.D. candidate in the Butcher Lab, will be joining the faculty at the Biomedical Engineering Department at Messiah College.

Gregory Fedorchak, a third year Ph.D. student in the Lammerding Lab, and **Erik Zavrel**, a sixth year Ph.D. student in the Spielman Lab, were selected as one of ten finalists for the CIMIT Primary Care Prize Competition for their proposal, "Active Distal Limb Heating for the Treatment of Insomnia." Zavrel also submitted second proposal that was also selected entitled, "Tongue Strengthening as an Alternative Treatment for Obstructive Sleep Apnea." Finalists are selected based on their project's potential in direct impact in primary care.

Chelsea Gregg, a fourth year Ph.D. candidate in the Butcher lab, won a Reviewer's Choice Award at the 2014 BMES annual meeting in San Antonio, TX for her poster titled, ""Gold Nanoparticles as Exogenous Soft Tissue Contrast for Live in Vivo MicroCT Imaging of Avian Morphogenesis." The Review's Choice Award is given to individuals by the appointed reviewer for each research category and subtrack for an outstanding abstract and/or presentation at the conference.

Darvin Griffin, a fifth year Ph.D. candidate in the Bonassar Lab, received the Mike Shinn National Society of Black Engineers (NSBE) Distinguished Member of the Year, one of the highest honors awarded to graduate students by the NSBE. This award is given to a female and male NSBE member who exemplifies the NSBE mission and who demonstrate high scholastic performance, dedicated service to the Society and other organizations, and who possess high professional promise. Griffin also received a BCA Scholarship in recognition for his outstanding achievement as well as dedicated service to the NSBE and their respective campus communities. In addition, Griffin received the 2015 Zellman Warhaft Graduate Student Diversity Award in recognition for his commitment to diversity issues.

Kyle Kentch, a 2014 M.Eng. graduate, won best poster award at GE's 3rd Annual Student Research Summit for his Master of Engineering project poster, "Non-Articulating Functional Replacement of the Temporomandibular Joint."

Julie Kohn, a third year Ph.D. student in the Reinhart-King Lab, received a BMES Travel Award and an Engaged Learning and Research Conference Grant from Cornell. She also received a Reviewer's Choice Award for her abstract at the annual BMES Meeting in 2014.

Marsha Lampi, a third year Ph.D. student in the Reinhart-King Lab, was awarded a BMES Travel award and a FASEB Travel Award in 2014.

Stephanie Lindsey, a fifth year Ph.D. candidate in the Butcher Lab, won a Whitaker International Scholar Fellowship to fund her postdoctoral work.

Alex Loiben, a first year Ph.D. student in the Cosgrove Lab, won a Roberta G. (1957) and John B. (1956) DeVries Graduate Fellowship for 2015-2016 in honor of his thesis research, which incorporates interdisciplinary work with the College of Human Ecology.

Erica Pratt, a seventh year Ph.D. student in the Kirby lab, was inducted into the Cornell chapter of the Edward A. Bouchet Graduate Honor Society. The Bouchet Society recognizes outstanding scholarly achievement and promotes diversity and excellence in doctoral education and the professoriate.

Alberto Purwada, a BME graduate student in the Singh Lab, was awarded the Howard Hughes Medical Institute Med-into-Grad Fellowship for the 2014-2015 academic year. This fellowship was awarded to graduate students conducting research that has the potential to impact clinical practice and would benefit from clinical mentorship. Alberto is working on engineering microenvironments for B cell disorders with Dr. Giorgio Inghirami at Weill Cornell Medical College

Anne Rocheleau, a fourth year Ph.D. candidate in the King Lab received a 2015 Cook Award from Cornell University. The Cook Award is named in honor of the late Constance E. Cook, Cornell's first woman vice president, and the late Professor Emeritus Alice E. Cook, founding member of the Advisory Committee on the Status of Women. The Cook Award honors individuals who deserve recognition for their commitment to women's issues and their contributions to improving the climate for women at Cornell University.

Derek Sung, an undergraduate student in the Butcher Lab, received a summer research fellowship at NIH.

Kiran Vaidya, an undergraduate student in the Butcher Lab, received a summer research fellowship at the American Heart Association.

Alexa Wnorowski, an undergraduate student in the Butcher Lab, was named a 2015 Merrill Presidential Scholar. The Merrill Presidential Scholars Program recognizes Cornell University's most outstanding graduating seniors who rank among the top one percent of their class.

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STEPHEN T. MONG COMMITS $500K GIFT TO BME FOR FACULTY RENEWAL

In June 2014, Cornell alum Stephen T. Mong (M.Eng. '92, M.B.A. '02) announced a $500K gift to support BME research through faculty renewal. Stephen gave the gift because he has a general interest in healthcare; while at Citigroup, a part of his portfolio was investments in medical companies, and his family in Hong Kong also actively supports a wide range of health care initiatives. In January of 2015, Stephen further showed his support by hosting a BME reception for Cornellians at the JP Morgan Healthcare Conference in San Francisco. He will be co-hosting the event once again at this year's conference.

The gift is directed toward Cornell's $50 million Faculty Renewal Sesquicentennial Challenge, an initiative to recruit outstanding new faculty in the face of an unprecedented number of retirements expected over the next decade. The challenge matches multi-year gift commitments of $500,000 or more on a dollar-for-dollar basis.

Stephen is founder and managing director of Orien Capital Management, LLC, a small business management company in New York, and CFO of Zaber Corporation, Inc. Previously, he held positions at Citigroup, JP Morgan, Jones Lang Lasalle, URS Corporation, and Foster Wheeler.

Stephen T. Mong with Beckie Robertson '82 (managing director at Versant Ventures) at the BME & CSV reception at the JPMorgan Healthcare Conference, January 2015.