

# WMAE

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**Winter 2017**

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**BREAKING RULES  
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# MESSAGE FROM THE DIRECTOR



Dear Sibley School Alumni and Friends:

I am happy to report that the Sibley School is in its new home! In August 2017, we moved into the lower floors of the newly renovated Upson Hall and, for the first time in many years, are not surrounded by construction (well, except that punch list thing...)! The new building is wonderfully bright and exceptionally functional for our diverse needs. The basement is now home of the Emerson Teaching Lab, Rapid Prototyping Lab, and project team space that has doubled in size. The first floor has a grand hallway that connects great entrances from Hoy Road to the engineering quad. The first floor houses administrative offices, the historical Reuleaux collection, and a new Upson Lounge with a terrace (we could never get rid of the lounge!).

The first and second floors have flexible classrooms, enabling a variety of instruction, from group work, to lecture style, to flipped classrooms, even distance learning. The second floor includes many of our experiential labs, such as the senior lab wind tunnels and design space. Finally, a key highlight of the building is flexible, non-programmed space on each floor for students to work in groups or simply relax/eat between classes. Each characteristic of the new Upson was designed to improve the function and experience of the education, learning and research for our students, and from student feedback so

far, I think the architects and builders have done an excellent job. Coupled with the state-of-the-art research facilities and faculty/Ph.D. offices on floors 3-5 which opened last year, we all believe the Sibley School is in great shape for many years to come. We held a grand opening during Trustee Council weekend in October; I encourage you all to stop by and see the new Upson when you are in Ithaca.

Our faculty highlight this year is Professor Hadas Kress-Gazit, including her research, education and leadership in the robotics area. Hadas and her Verifiable Robotics Research Group develop formal mathematical methods and tools that enable robots to operate in their environment. More specifically, higher-level specifications are defined, such as from human natural language, and her group develops tools to automatically generate software for the robot to perform its functions in a guaranteed fashion. The approaches are broadly applicable—from robots in the home to disaster relief to autonomous driving. While it is natural to focus on research highlights, Hadas is also an award-winning teacher, including having developed an autonomous mobile robots course and regularly teaching the wildly popular Mechatronics course; and is in many leadership roles, including leading a \$7.5M MURI research effort and program chair for the 2018 Robotics Science and Systems Conference, the top robotics conference internationally.

In a sampling of other faculty news, Professors Perrine Pepiot and Meredith Silberstein both won NSF CAREER awards. Professor Rebecca Barthelmie won a Fulbright award, and is currently on sabbatical at the Wind Energy Department of the Danish Technical University. Professor Max Zhang continues his broad external impact in the environmental area, which has led to an award from the EPA, and a Cornell Engaged Scholar Prize. Finally, we hired two new faculty this year—Nikolaos Bouklas who works in the area of computational mechanics, and Mahdi Esmaily who works in the area of computational

biofluids. Both arrive in January 2018, and we will give a more detailed introduction in next year's newsletter. I am sorry to report that Professor Emeritus Franklin K. Moore, ME '46, Ph.D. AE '49 passed away. Frank was initially a Professor in the Graduate School of Aeronautical Engineering, through its 1972 merger with Mechanical Engineering. He received a NASA Exceptional Scientific Achievement medal for his contributions in the areas of fluid mechanics, turbomachinery, heat transfer and flow disturbances in compressor in-lets and diffusers. Moore, an avid cyclist and cross country runner, completed the Boston Marathon in 1971, 1972, 1977 and 2002. In 2002, at age 80, Frank held the honor of second-ranked runner in the nation for his age group. He is missed.

In educational news, a key milestone for the Sibley School this year was our passing of the ABET accreditation. Every six years, our department prepares a lengthy report on our undergraduate program, and hosts a two-day visit of external reviewers. Our review occurred in the Fall of 2016, and the Sibley School passed with flying colors, with only strengths and no weaknesses. In fact, our excellent organization, multiple approaches to continual feedback and improvement, and the flexibility of our senior design options were noted by the reviewers as "highlights" of the college. A special thanks to the key leaders of our ABET team, Professor Matt Miller, our ABET "czar," Betta Fisher, associate director for undergraduate studies, and Emily Ivory, who organizes our "continual" ABET efforts for feedback and improvement, which provided the building blocks for the report, visit, and success of the review.

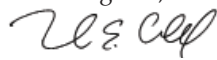
Our alumni spotlight this year is Lowell C. McAdam, ME '76, the Chairman and CEO of Verizon Communications. Lowell is an upstate New Yorker at heart, and attended Cornell and the Sibley School on a Navy ROTC scholarship. After spending time with the Navy's Seabees, and early engineering jobs, he moved into communications. He has led Verizon in various

forms since 2007, where he is the lead architect in the global wireless industry. Lowell serves on Cornell's Board of Trustees, and recently endowed Lowell & Susan McAdam Professorships of Heart Assist Technology, in honor of his late wife Susan. I think you will find Lowell's experiences and advice compelling.

Finally, a big change for our department this year is the departure of Nanette Peterson, our undergraduate coordinator for the past 20 years. As many of the recent graduates know, Nanette was absolutely beloved by all because of her passion for our students. She not only provided guidance on what is required in the MAE flow chart, but personal advice and mentoring. With an easy smile and laugh, and a quick story—we all have a great set of memories with Nanette. We wish her luck as she moves to Arizona to be closer to kids and grandkids. Happily, I can also add that Emily Ivory has taken over as the undergraduate coordinator. As many of you know, Emily brings a wealth of experience and positive energy to the position, having worked at MAE for a number of years with the project teams and as Nanette's second in command. She has already made her mark on the first floor of the new Upson.

The newsletter includes updates from reunion, project teams, and a profile of two of our Ph.D. students, Yuhao Xu and Elvis Cao. Please keep in touch with us about your news and successes through the alumni link on our website, or simply a quick email to [mae\\_alum\\_news@cornell.edu](mailto:mae_alum_news@cornell.edu). We look forward to hearing from you.

Warm regards,



Mark Campbell,  
Sibley School Director



Image by: University Photo

Commencement, May 28, 2017  
Nanette Peterson with  
Emilie Camera, B.S. ME '17

Nanette's supervisor, Colleen McClenahan said, "Nanette was an advocate for students 100 percent of the time. She wanted nothing more than to see them succeed. If I had to describe Nanette's approach to her job it would be dedication and total commitment. She also loved to laugh and had a wicked sense of humor. Seeing the irony in a situation was never lost on her. Nanette left an indelible mark on the department and I'm sure many students would say that she had a major impact on their lives at Cornell."

## CAN YOU FIGURE OUT WHERE THIS PICTURE WAS TAKEN?



Image by Kirk Gunsallus

Answer:

Looking out the window on the third floor walkway between Upson and Duffield, looking East and seeing the corner of Upson.

**N**anette Peterson retired on July 31, 2017 after over 21 years of service to Cornell University, almost all of which were as the undergraduate academic advisor and coordinator in the Sibley School of Mechanical and Aerospace Engineering.

Students were always her number one priority. She tirelessly sought ways to give them a positive experience and to promote a sense of community in what can be a stressful environment. There was never a doubt that the students were cared for by Nanette.

Emily Ivory, who worked directly with her and became her successor, is thankful to have had Nanette as her supervisor. "She always had such faith and trust in everybody. We had an excellent working relationship and made a very effective team. Nanette was an amazing mentor and friend, and continues to be a source of inspiration," said Ivory.



# FACULTY PROFILE/ RESEARCH

**P**rofessor Hadas Kress-Gazit leads the Verifiable Robotics Research Group, which develops formal methods for robotics—mathematical techniques and tools for automatically generating robot control that provides guarantees for a robot's behavior in the world.

Currently, to get a robot to do a task such as clean the floor, patrol an area or assemble a product, a team of highly-trained engineers program the robot in a time consuming and error prone process. This process includes thinking about what the robot should do (the specifications), writing code (the implementation) that may or may not fully capture the specification, and testing the robot in as many situations as possible. Whenever the robot does something unexpected or undesirable, the team needs to rewrite code, rerun tests and repeat the process. At some point the team gains enough confidence that the robot will behave “well” but there are no guarantees that the robot will not fail in the future nor is there usually any analysis of the robot's limitations, for example, in which situations it is likely to fail.

The research done in Kress-Gazit's group is changing the robot control paradigm in several ways: by enabling users to write specifications that are then automatically transformed into implementations, providing automated feedback regarding the ability of the robot to complete its task, incorporating physical aspects of robots and their environment into the synthesis

and analysis, and by exploring specifications for different types of robots including modular robots, soft robots and swarms.

Kress-Gazit is the principle investigator of a recently awarded 7.5 million dollar Office of Naval Research MURI award (Multidisciplinary University Research Initiatives) that is a collaboration between Cornell, MIT and Brown University. This project, titled “PERISCOPE: Perceptual Representations for Actions, Composition, and Verification,” will create autonomous systems (robots) capable of completing complex missions in unstructured and changing environments. The theory and tools created by the project will enable robots to self-assess and self-repair their behavior, thus making them resilient to unexpected situations.



The Verifiable Robotics Research Group:  
(Left) Salar Moarref, Catherine Wong, Hadas Kress-Gazit, Ji Chen,  
Thais Campos, Adam Pacheco, Jim Jing, and Scott Hamill.



**VERIFIABLE  
ROBOTICS  
RESEARCH GROUP**



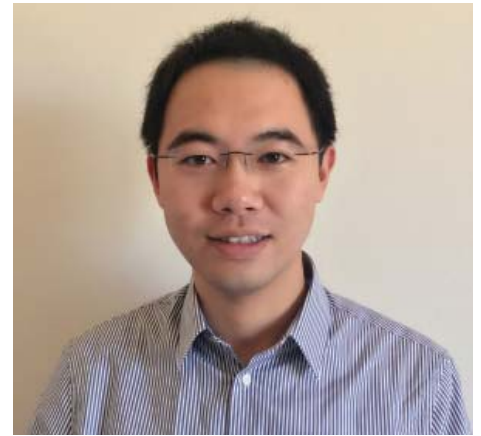
**P**etroleum-based liquid fuels have been a dominant source of energy for various sectors (e.g., buildings, industrial, and transportation) for over a century, and this demand will be sustained as the world consumption of marketed energy continues to expand. The increasing demands for liquid fuels and associated environmental concerns have motivated research and investments in exploring renewable solutions to reduce the consumption of conventional petroleum-based fuels and greenhouse gas emissions. Blending the petroleum fuels with bio-derived fuels is a well-known strategy for reducing both consumption of petroleum fuels and harmful emissions. Biofuels offer a simple volume displacement of petroleum-based fuels that reduces consumption, and they typically bring a range of chemicals that lack the relative propensities for harmful emissions to the mixture.

With the increased interests of biofuels, the majority of research has focused on production technologies. Less understood are their fundamental combustion dynamics. The extent to which biofuels perform relative to the conventional petroleum fuels they would ostensibly be blended with is of particular interest. Most desirable is for a biofuel to be a 'drop-in' replacement for a conventional petroleum-based fuel. To access this possibility, combustion properties are needed to evaluate the combustion performance of liquid fuels of interest.

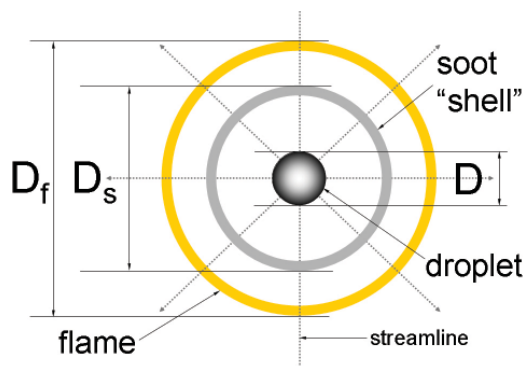
BY: **YUHAO XU**  
MAE PH.D. STUDENT

My work at Cornell is to examine the combustion characteristics of bio-derived fuels and practical transportation fuels using a fundamental configuration that establishes a link to terrestrial applications. The combustion configuration used is an isolated droplet burning within an environment that promotes spherically symmetric conditions. The droplet combustion process is the only liquid burning configuration that is amenable to detailed numerical modeling. Moreover, it is very relevant to the broader context of engines in that droplets represent the fine grid structure of sprays.

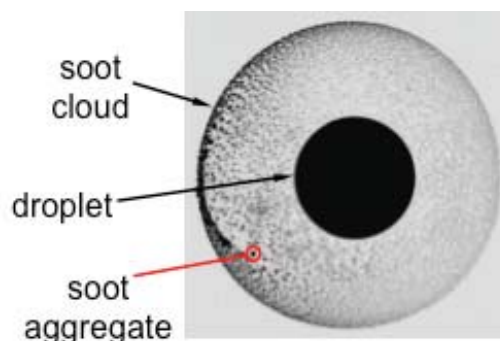
Experiments are carried out at low gravity (on the order of 10<sup>-4</sup> of normal gravity on Earth), using "small" droplets with an initial diameter of about 0.5 mm, restricting their motion by anchoring them to very small support structures (or fibers), and employing a stagnant ambient in the experiments. As such, the spherical symmetry of a droplet flame will result. Low gravity is created by carrying out experiments in free-fall such that the droplet with its immediate surroundings is burned while it falls. A drop tower at Cornell University, which is 7.6 m high and provides about 1.2 s of experimental run time with low gravity, is used for this purpose. During the fall, the fuel droplet is ignited by spark discharge across two electrode pairs positioned on opposite sides of the



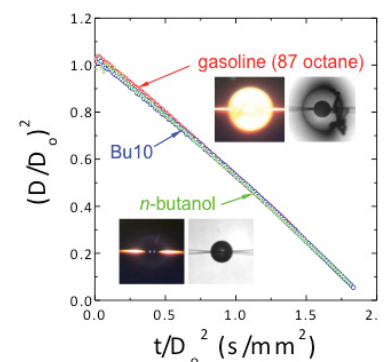
droplet. A black-and-white digital camera and a color camera that provide perpendicular views of the droplet record the droplet burning history. I then measure droplet, soot shell, and flame diameters from recorded video images to evaluate the combustion performance of biofuels compared to practical transportation fuels structure to compliment the wind's magnitude. The turbulence intensity can also be decreased. In the Laboratory for Intelligent Machine Systems (LIMS), wind tunnel experiments have been performed using different façade types including sloped building facades and elliptical building façades. Using two dimensional results of the aforementioned, innovative designs for three dimensional structures have been simulated using parameter optimization methods to determine the "perfect" building structure for both energy harnessing and practicality.



Schematic of an isolated droplet combustion configuration with spherical symmetry.



Backlit photograph at one instant during burning of a n-decane droplet showing the soot cloud (the flame is well outside the field of view in this image).



Evolution of droplet diameter measurements for gasoline, n-butanol, and a mixture of them containing 10% n-butanol by volume.



# STUDENT HIGHLIGHT/ RESEARCH



BY: **XIANGKUN (ELVIS) CAO**  
MAE PH.D. STUDENT

**A**fter building an aqueous particle sensor to monitor metal cleanliness for steelmaking industries at McGill and investigating a novel fuel cladding to enhance accident tolerance for nuclear plants at MIT, I never expected my next steps would be to develop the *FeverPhone* device for biomedical application, and the *HI-Light* reactor for carbon conversion, in Professor David Erickson's lab at Cornell.

## **FeverPhone—Fever Diagnosis on Your Phone**

Acute undifferentiated febrile illnesses are responsible for substantial morbidity and mortality globally. The need for rapid differential diagnosis for acute febrile illness (AFI) stems from the relatively large number and types of agents that may be the cause and the variations in how treatment is administered. In this context, the Erickson Lab at Cornell is developing the *FeverPhone*, a smartphone based molecular diagnostics platform for differential diagnosis of six common causes of AFIs (namely: dengue, malaria, chikungunya, leptospirosis, typhoid fever, and chagas), which represent the majority of the global burden. In parallel with technical development, this system will be fully validated at our existing field site in Ecuador and be ready for FDA approval by the end of the effort.

In the *FeverPhone* project, I have been

working on developing a rapid diagnostic kit for typhoid fever infection, a dual assay for typhoid and malaria differentiation, and a triplex for three food-poisoning bacteria through a microfluidic paper-based detection. We believe the real-time, rapid and accurate diagnosis to identify the causative pathogen would shift current practices from syndromic-based diagnosis to more personalized diagnosis and informed treatment decisions.



## **The Highlights of HI-Light**

Besides *FeverPhone*, I am also working on a totally different project called "*HI-Light*," a solar thermal chemical reactor technology for converting CO<sub>2</sub> to fuels. The extraction and consumption of fossil carbon to run our daily lives accounts for over 6 billion metric tons of CO<sub>2</sub> emissions each year, driving climate change. Creating high-value products from CO<sub>2</sub> by using energy from all parts of the solar spectrum to photocatalytically produce renewable fuels will make CO<sub>2</sub> capture and conversion economical. Similar to fiber optics in telecommunications, our patented wave-guide technology will enable the light distribution evenly within our reactor so as to increase reaction rate, decrease capital cost, and increase operation outcomes. The innovative claim of the *HI-Light* reactor design derives from the concurrent optimization of light-coupling and catalyst availability.

In addition to winning the \$20K Grand Prize in the NASA Tech Briefs "Create the Future" Design Contest and advancing into Round 2 of the \$20M NRG COSIA Carbon X-Prize, the Cornell team has been in talks with Shell to develop a reactor that will create syngas.



## **The Possibilities Are Endless**

I never imagined I would jump into the biomedical field until I joined the Erickson Lab which has so many lines of research: mobile and global health technology, microfluidics, photonics and nanotechnology. As a scholar and entrepreneur, Professor David Erickson is a good role model for us. Life is full of surprises and the possibilities are endless.

# FACULTY



Professor C.  
Thomas Avedisian

**Awarded \$1.2 Million for Biofuels Combustion Research** from The Department of Energy's (DOE) Co-Optimization of Fuels and Engines (Co-Optima) program.



Professor Rebecca  
Barthelmie

**Appointed as an Associate Director** of the Cornell Energy Institute. She is a co-PI of a multi-million dollar grant from the Department of Energy for their

research, *"A Hierarchical Evaluation Framework for Assessing Climate Simulations Relevant to the Energy-Water-Land Nexus."* Also the 2017-'18 Fulbright U.S. Scholar Grant to Denmark for her project: *"Harnessing the 'power of the wind': Building bigger and better wind farms."*



Senior Lecturer  
John Callister

**Louis H. Zalaznick Teaching Assistantship Award** for his entrepreneurship work at Cornell.



Professor Emeritus  
Joe Burns

**Dedication of office in his name by Cornell University**, the Joseph Burns Faculty Office in Upson Hall.



Associate Professor  
Olivier Desjardins

**2016 College of Engineering Excellence in Teaching Award** for his excellence in mentoring and educating students.



Professor David  
Erickson

**FuzeHub Award** for development of the VitaScan diagnostics platform. Also, part of a \$1M NIH grant to hone technology for in-the-field diagnosis of Kaposi's sarcoma.



Associate Professor  
Elizabeth Fisher

**Outstanding Teacher Award** from St. Lawrence Section, ASEE, for being an outstanding educator, and a leader for education and students.



Professor Emeritus  
Sidney Leibovich

**Named Fellow** of the American Association for the Advancement of Science.



Professor Michel  
Louge

**National Science Foundation and NASA's CASIS Fund** to send experiments to the International Space Station.



Associate Professor  
Perrine Pepiot

**Promoted to Associate Professor** effective July 1, 2017. NSF Career Award from the Division of Chemical, Bioengineering, Environmental, and Transport Systems (CBET). Also, awarded \$1.2 million for biofuels combustion research from the Department of Energy's (DOE) Co-Optimization of Fuels and Engines (Co-Optima) program.



Professor Richard  
Rand

**2017 Thomas K. Caughey Dynamics Award** from the ASME Applied Mechanics Division (AMD) for making significant contributions to the field of nonlinear dynamics through outstanding leadership.



Assistant Professor  
Robert Shepherd

**2016 College of Engineering Excellence in Teaching Award** for his excellence in mentoring and educating students. Also, the Office of Naval Research Young Investigator Program (YIP) award to further develop hydraulically actuated systems, including exoskeletons.



Assistant Professor  
Meredith Silberstein

**NSF Career Award** from the Division of Civil, Mechanical and Manufacturing Innovation (CMMI).



Assistant Professor  
Ankur Singh

**2017 Young Investigator Award** from the Society for Biomaterials. Also, a grant from the U.S. Department of Defense (DoD) through its Peer Reviewed Cancer Research Program.



Associate Professor  
Max Zhang

**Engaged Scholar Prize** for his community-based teaching, learning and research.

# Students

**The Sibley School community congratulates the graduated students who achieved the highest scholastic averages in mechanical and aerospace engineering for 2017.**



## 2017 Senior Class

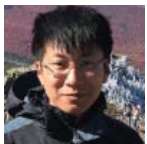
**Speaker:** Jeanne Lee: B.S. ME '17.

*"My Cornell experience was incredible, not only due to the*

*advanced education that we experienced but because the campus network is life-changing. Coming from the West Coast, I did not know many people but I found that it was not only easy to make new friends, but it was easy to find a community that is diverse, intelligent and caring. My Cornell family pushed me to exceed further than what I could have imagined I could have succeeded within four years, and I will be taking this valuable time with me to pursue even bigger achievements."*

## H.D. Block Graduate Teaching Prize:

Judgment criteria is based on recommendations by student feedback and endorsed by instructors. For their dedication and excellence as a teaching assistant in Engineering Mathematics and Engineering Mechanics.



**Award Recipient:** Yi Xu: Ph.D. TAM '17.

*"My time at Cornell as a graduate student provided me with an immeasurably*

*valuable experience both in research and teaching. As a teaching assistant in TAM, I had the opportunity to explore the beauty that lies in the intersection of math and engineering together with the students. I feel very fortunate to receive this H.D. Block Teaching Prize."*

## Recipients of the 2017 Sibley Prize:

The Sibley prizes were established in 1884 for the two seniors with the highest scholastic averages.

**Award Recipients:** Charles Miller: B.S. ME '17; Lucy Wang: B.S. ME '17.



**Charles Miller:**

*"At Cornell I not only worked with some of the best faculty in the field and the most helpful staff, but also friendly*

*and driven students that I could take inspiration from. Studying for classes and working through projects was never an individual activity for me; I owe it all to my peers who helped me along the way. I thank Cornell for creating an educational environment that supported cooperation among its students! I look forward to connecting with more students and faculty in my final semester at Cornell this fall."*



**Lucy Wang:**

*"My time at Cornell was filled with great experiences and great challenges. These past four years have pushed me to*

*change my perception of what I am capable of. With the help of the amazing people I met along the way, I have accomplished more than I ever dreamed possible."*

## Outstanding Senior:

Awarded to a student who has exemplified strong leadership skills for the Cornell Chapter of the American Society for Mechanical Engineers.

**Award Recipient:** Rannie Dong: B.S. ME '17.

## Thomas J. and Joan T. Kelly Prize:

Award based on excellence in aerospace

engineering, as demonstrated through coursework or an innovative design project. The awardee must show tangible evidence of being a well-rounded person with an outstanding non-engineering contribution to Cornell and/or the greater community.

**Award Recipients:** Tytanan Burney: B.S. ME '17; Eric Fiegel: M.Eng. ME '17; "Flux Pinned Interface for Mars Sample Return," research with Professor Mason Peck.



**Tytanan Burney:**

*"I am very grateful for the amazing friendships I've found here at Cornell and for the indispensable guidance*

*I've received from faculty, mentors and students that came before me. I have learned so much about the world of possibilities in engineering through amazing experiences working on real-world challenges I could never have anticipated. Cornell has allowed me to explore to find something to be passionate about, and I hope to carry these experiences for a lifetime."*



**Eric Fiegel:**

*"For me, Cornell was a time to explore new interests and seize opportunities. Project teams, research labs, clubs,*

*outdoor adventures and many more exciting possibilities were everywhere on campus. I strived to make the most of my short time at Cornell, and I encourage current/incoming students to do the same!"*

## 2017 Outstanding Achievement

**Award:** This award is presented to the graduating student who has achieved the highest academic standing in the Master of Engineering Program.

**Award Recipient:** Timothy Coda: M.Eng. ME '17.



**Walter Werring Prize:** Awarded to graduating students in 2017 who have enhanced the Cornell community, excelling in leadership efforts in a manner befitting the reputation of the Sibley School. For their efforts towards creating the 2017 senior video as a gift to their 2017 mechanical engineering classmates.

**Award Recipients:** Emilie Camera B.S. ME '17; Andrew Egan Tan: B.S. ME '17.



**Emilie Camera:**  
*"I saw my time as a Cornell undergrad as a time to learn and explore. In the MAE undergraduate curriculum, it's easy to get bogged down by the seemingly never ending amount of problem sets, labs, prelims and reports. But at a university where there is something new to see every day, it's important to keep in mind that there is so much more to learn than what is presented in the lecture hall. Of course I learned about solid mechanics and turbulent flow just like every other MAE student did, but by interacting with students in other colleges, I was able to expand my learning beyond the curriculum. Time spent exploring this campus is not time wasted, and to me, procrastinating on my homework for the extra 2 hours was worth the knowledge I gained through meeting a variety of knowledgeable students. The people you meet on this campus and the experiences you have outside of classes are something that is unique to Cornell, and it's important to make the most of your time on the hill while it's still available to you."*

*This award came as a huge surprise to me—I had no expectations to receive any kind of recognition for the MAE senior video beyond the verbal praise of my classmates. To me, this award is more than a recognition of the work that Andrew and I had put into this project, it's a sign of remembrance. It validates that our classmates will be able to watch this video and reminisce about their time as a Cornell MAE*

*student, and that the two of us will forever be known by our professors as "the ones that seem to spend more time on the video than their school work." Traditions like this are what make the Cornell MAE program so unique. I consider myself lucky to have been a part of this close-knit community and I am honored that I was able to give back to it in a way that those involved can remember forever. I am immensely grateful to be recognized through the Walter Werring Award, and for the opportunity to contribute to the legacy of the Cornell MAE community."*



**Andrew Egan Tan:**  
*"Cornell has given me so many memories, and so many things to be grateful for. Throughout the years here, I can't believe how many people I've met—all the 8 a.m.s and all-nighters we've had together, sports teams and project teams day in and day out. I owe a lot of who I am to this place; it really has felt like the 'good ol' days' and I'm happy to have spent those days here."*

**Frank O. Ellenwood Prize:** Awarded to the mechanical engineering students with the highest GPA's in heat and power courses.

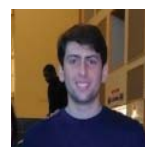
**Award Recipients:** Scott Soltis: B.S. ME '17; Lucy Wang: B.S. ME '17.



**Scott Soltis:**  
*"My time at Cornell was tremendously valuable to me. The Cornell community allowed me to strive to fulfill my potential as a student-athlete and afforded me every opportunity to grow as a person. I am incredibly grateful to all of the faculty and members of the Cornell community (professors, university staff, athletic coaches and fellow students) that helped me be the best me I could be."*

**McManus Design Award:** This award is related to design. Judgement criteria was based on a technical paper of single or joint authorship presenting an original solution to a design problem or project.

**Award Recipients:** Victoria Campbell: M.Eng. ME '17; "Force Optimized Wind Turbine Blade Design," research with Professor Rebecca Barthelmie; Ethan Kramer: M.Eng. ME '17; "Design of a Composite Foot Prosthesis for Uneven Terrain," research with Professor Matthew Miller.



**Ethan Kramer:**  
*"My time at Cornell meant not only growing as an engineer, but also growing as a person. I made so many*

*great friends, tried so many new things, and learned so much about what I want to do in life post college. The lessons I learned while at Cornell will serve me well into the future, and I will cherish all the memories I made during my time here."*

**Sibley Prize for Excellence in Graduate Teaching Assistance:** Awarded to Ph.D. students, recognizing their dedication and excellence as teaching assistants for Sibley School courses.



**Award Recipient:** Erin Cresswell: Ph.D. ME '17.  
*It was such an honor to be recognized for the TA award, specifically since the students*

*had to nominate me. I always planned to pursue teaching someday as I really enjoy it, and receiving this award gave me the positive feedback and encouragement that tells me it's the correct path. I want to thank the fall semester class of MAE 2020 for never leaving me bored or alone in office hours, for sharing their frustrations and successes with me, and for being a curious and fun group. I learned a lot from you all too, more than you know, thank you!*

## SUPPORT MAE

**Bart Conta Prize in Energy and Environment:** Award based on project summaries from students who have done the best work on a research or design project dealing with energy and the environment.

**Award Recipients:** Mackenzie Kinard: M.Eng. ME '17; Kaleb Rousch: M.Eng. ME '17; "Parcel-Level Wind and Solar Energy



Potentials and Site Selection for New York's "50 by '30" Energy Plan: A GIS-Based Analysis," research with Professor K. Max Zhang.

Mackenzie Kinard: "During my five years at Cornell, I met peers I've grown to love, mentors who've provided personal and professional guidance, and explored more gorges than I can name. Cornell instilled a life-long hunger for learning, leading me to discover my passion for renewable energies, and I look forward to pursuing a meaningful career in the field."

Kaleb Rousch: "Having received my undergraduate degree in a non-engineering field, my time at Cornell helped me become the engineer that I now am in the energy sector. The breadth of knowledge I obtained challenged me to think in new, creative ways consistently, preparing me well for my career where I am challenged daily. The professors and advisors in the M.Eng. program were incredible instructors during this time, through my project and my professional development.

**Giving:** Private gifts are essential and help to ensure the continued excellence, relevance, and impact of initiatives for MAE. To make a gift using the secure online gift form, please visit: [www.giving.cornell.edu](http://www.giving.cornell.edu) or a check made payable to Cornell University, may be mailed to: Cornell University, PO Box 25842, Lehigh Valley, PA 18003-9692. Please be sure to indicate your intention to designate your gift to MAE. Corporate matching gifts count as a gift from you and are a powerful way to double your giving. 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 designed to meet your family's financial and philanthropic goals, including securities, trusts, bequests and real estate. Please visit the Office of Trusts, Estates, and Gift Planning website: <http://www.alumni.cornell.edu/fund/ways.cfm>.



Looking down the stairwell (Hoy Rd. side), Upson Hall. Image by Laura Black

## GIVING OPPORTUNITIES

**Graduate Fellowships:** Our goal is to provide funding to each first-year Ph.D. student and to provide fellowships as part of the startup for new faculty.

**Digital Manufacturing Initiative:** Purchase and maintain new, modern equipment (e.g. 3D printing, laser cutters, etc.) for the design and fabrication of engineered systems, particularly for undergraduate research and project teams.

**Teaching Laboratory Specialist:** Additional technical specialist in support of experiential learning, including instructional labs, shops, wind tunnels and digital manufacturing.

**Teaching Laboratory Fund:** Add new and renew laboratory equipment used in student labs, which serve as a cornerstone of the Sibley School courses.

**Design Lecturer:** Professor of Practice to lead MAE design program, teach design courses, lead the M.Eng. program and provide liaison with industry.

**Online Learning Initiatives:** Develop a new series of online materials (lectures, problems, interactive sessions, simulations).

**Research Seed Grants:** Provide support for faculty to undertake new initiatives, new directions and interdisciplinary collaborations.

**Distinguished Speakers Fund:** To enable highly distinguished speakers to visit the Sibley School for the Colloquium and courses.

**Student Projects:** Provide support for undergraduate and M.Eng. student projects in design, project teams or research.

**Student Organizations such as ASME and AIAA:** Provide support for outreach activities as well as travel to student conferences.



## Professor Avedisian gives ASME heat transfer division plenary lecture:

On day three of the ASME 2016 Heat Transfer, Fluids Engineering and Microchannel Conference in Washington, D.C. on July 13, 2016. ([http://www.mae.cornell.edu/news/index.cfm?news\\_id=95259&news\\_back=news%5Farchive%26y%3D2016](http://www.mae.cornell.edu/news/index.cfm?news_id=95259&news_back=news%5Farchive%26y%3D2016))



## Engineering a robotic smart home interface:

Professor Guy Hoffman's vision of robots in the home does not include "little white astronauts," as he calls the conventional notion of how domestic robots should look. (<http://www.deskeng.com/de/engineering-a-robotic-smart-home-interface/>)



## Senior Lecturer Rajesh Bhaskaran discusses his experience with the MOOC and online learning in engineering education on CornellCast:

He uses a self-recording studio to blend and annotate Blackboard, Powerpoint and software demonstrations, and Skype conversations to tap into insights of industry experts. (<http://www.cornell.edu/video/rajesh-bhaskaran-online-learning-engineering-education>)



## The threat of robot guards is not enough to stop people stealing:

Would you do what a robot told you to do? If people stealing food right under the eyes of a bot is anything to go by, RoboCop is still a long way off. (<https://www.newscientist.com/article/2104287-the-threat-of-robot-guards-is-not-enough-to-stop-people-stealing/>)



## Engineering students build bridge, friendships in Bolivia:

Eight engineering students from Cornell traveled to Calcha, Bolivia, during summer break for an eight-week bridge-building project during which they developed bonds with the community there. (<http://www.news.cornell.edu/stories/2016/09/engineering-students-build-bridge-friendships-bolivia>)



## Cornell's quest: Make the first CubeSat to orbit the moon:

A team of students, led by associate professor Mason Peck, is attempting to send a CubeSat, a small satellite made from readily available hardware, into orbit around the moon with water as a propellant. (<http://www.news.cornell.edu/stories/2016/09/cornells-quest-make-first-cubesat-orbit-moon>)



## Cornell Engineering to offer systems Ph.D. program:

A doctoral program in systems was started by Cornell University's College of Engineering beginning in fall 2016 and will prepare students to tackle some of the world's most complex logistical problems. (<http://www.news.cornell.edu/stories/2016/09/cornell-engineering-offer-systems-phd-program>)



## Research team prototypes spacecraft propelled by water:

What would you explore if you owned your own spacecraft? The rings of Saturn? The surface of Mars? (<http://cornellsun.com/2016/10/11/research-team-prototypes-spacecraft-propelled-by-water/>)



## Mechanical Engineering student selected as 2016-17 Frank and Rosa Rhodes Scholar:

**ship recipient:** The Sibley School of Mechanical and Aerospace Engineering community congratulates Shoshaunah Jacob, B.S., ME '18. ([http://www.mae.cornell.edu/news/index.cfm?news\\_id=95541&news\\_back=news%5Farchive%26y%3D2016](http://www.mae.cornell.edu/news/index.cfm?news_id=95541&news_back=news%5Farchive%26y%3D2016))



## 'NutriPhone' startup joins Cornell's McGovern incubator:

Put healthful eating in the palm of your hand: VitaMe Technologies—the Cornell start up group that makes NutriPhone for personal nutrition testing—has joined the university's McGovern Center. (<http://www.news.cornell.edu/stories/2016/10/nutriphone-startup-joins-cornells-mcgovern-incubator>)



## Avedisian group wins artistic merit award at ASGSR meeting:

The Blossom of Heat wins award at the 32nd Annual Meeting of the American Society for Gravitational and Space Research (ASGSR) 2016 Combustion Art Competition held in Cleveland, Ohio. ([http://www.mae.cornell.edu/news/index.cfm?news\\_id=95824&news\\_back=news%5Farchive%26y%3D2016](http://www.mae.cornell.edu/news/index.cfm?news_id=95824&news_back=news%5Farchive%26y%3D2016))



## Professor Silberstein, Professor Shepherd, and Ilse van Meerbeek featured on NOVA Documentary:

Treasures of the Earth: Metals. (<https://www.youtube.com/watch?v=AAb0GHdlykA>)



## NASA may upend space travel with experimental research:

Mason Peck, associate professor, authors this *Newsweek* opinion piece on NASA's EM drive and the value of experimental research. (<http://www.newsweek.com/nasa-em-drive-space-exploration-525147>)



# MAE NEWS AND SPOTLIGHTS



**Underwater hydrojetting system** wins the runner-up prize under the guidance of Professor Robert Shepherd: in the Soft Robotics Toolkit 2016 annual competition. (<http://softroboticstoolkit.com/announcing-winners-2016-annual-soft-robotics-competitions>)



**Stretchable optical waveguides help prosthesis grasp, feel:** A Cornell engineering group has devised a method for allowing strain and tactile sensing in a soft prosthetic hand, through the use of stretchable optical waveguides. (<http://www.news.cornell.edu/stories/2016/12/stretchable-optical-waveguides-help-prosthesis-grasp-feel>)



**Behold a robot hand with a soft touch:** featured in the first issue of *Science Robotics* and *NPR*. (<http://www.npr.org/sections/alltechconsidered/2016/12/11/504953475/ behold-a-robot-hand-with-a-soft-touch>)



**Tailored organoid may help unravel immune response mystery:** Cornell Engineering and Weill Cornell Medicine researchers report on the use of biomaterials-based organoids in an attempt to reproduce immune-system events and gain a better understanding of B cells. (<http://www.news.cornell.edu/stories/2017/01/tailored-organoid-may-help-unravel-immune-response-mystery>)



**Professor Chris Hernandez video** explaining orthopedic research. (<https://www.youtube.com/embed/o4dgqJ9YcmE>)



**Voyages—Sprites, Space Lego, creativity:** What's a space-exploration platform—the size of a Wheat Thin cracker—with propulsion, communications, and processing systems, sensors and memory? (<https://research.cornell.edu/news-features/voyages%E2%80%94sprites-space-le-go-creativity>)



**World's largest wind-mapping project spins up in Portugal** reports *Nature News*. MAE Croll Fellow, Professor Rebecca Barthelmie and her team seeks better picture of wind as it moves over rugged terrain. (<http://www.nature.com/news/world-s-largest-wind-mapping-project-spins-up-in-portugal-1.21481>)



**Sage Designs, a team from MAE 4340: Innovative Product Design** has been selected as a finalist in the "Innovating Aging in Place" Design Challenge at the Stanford Center on Longevity. ([http://www.mae.cornell.edu/mae/news/spotlights.cfm?s\\_id=689&page=3](http://www.mae.cornell.edu/mae/news/spotlights.cfm?s_id=689&page=3))



**Meet the Millers, a Cornell Engineering father-daughter team:** Father and daughter Matt and Chaney Miller talk about life as a student and as a professor at Cornell Engineering. ([http://www.mae.cornell.edu/mae/news/spotlights.cfm?s\\_id=688&page=3](http://www.mae.cornell.edu/mae/news/spotlights.cfm?s_id=688&page=3))

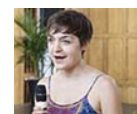


**Researchers link robots to surveillance teams:** Researchers are developing a system to enable teams of robots to share information as they move around and if necessary get help in interpreting what they see, enabling them to conduct

surveillance. (<http://www.news.cornell.edu/stories/2017/04/researchers-link-robots-surveillance-teams>)



**Cornell Research Online—predicting how new materials behave:** Professors Paul Dawson and Matt Miller along with collaborators build an integrated infrastructure for prediction of monotonic and cyclic plastic properties of polycrystalline metallic materials. (<https://research.cornell.edu/research/predicting-how-new-materials-behave>)



**2017 Merrill scholars honor their teachers and mentors:** Thirty-three outstanding seniors were recognized May 24 at the 29th annual Merrill Presidential Scholars Convocation. (<http://www.news.cornell.edu/stories/2017/05/2017-merrill-scholars-honor-their-teachers-and-mentors>)



**Jiajun Gu, a Ph.D. student in Professor Zhang's group** has received the Excellent Poster Presentation award at the 2017 American Meteorological Society (AMS) Annual Meeting. (<https://ams.confex.com/ams/97Annual/webprogram/Paper314813.html>)



**Lymphoma-on-Chip, technology to study drug-resistant tumors:** Cornell research online highlights Professor Ankur Singh's LETSSGo, Lymphoma-on-chip Engineered Technology for Single-Organoid Sequencing and Genomics. (<https://research.cornell.edu/research/lymphoma-chip-technology-study-drug-resistant-tumors>)



**ASME—MECHANICUS Spring edition!** Formula SAE Team's 21st Anniversary; Visionary Roboticist

Guy Hoffman: Redefining Robo. ([http://auth.cengr.commonspotcloud.com/mae/news/upload/Mechanicus\\_vol7issue2.pdf](http://auth.cengr.commonspotcloud.com/mae/news/upload/Mechanicus_vol7issue2.pdf))



**Prateek Sehgal and Xiangkun (Elvis) Cao win 2nd place and the 'peoples choice'**

**award** at the 3rd annual Cornell Three Minute Thesis®. ([http://www.mae.cornell.edu/mae/news/spotlights.cfm?s\\_id=695&page=2](http://www.mae.cornell.edu/mae/news/spotlights.cfm?s_id=695&page=2))



**Xiangkun (Elvis) Cao, a Ph.D. student in Professor David Erickson's lab** was selected as the

Graduate Division Winner for all disciplines in the fifth annual Student Research Showcase Competition, run by Sigma Xi - The Scientific Research Honor Society. ([http://www.mae.cornell.edu/mae/news/spotlights.cfm?s\\_id=696&page=2](http://www.mae.cornell.edu/mae/news/spotlights.cfm?s_id=696&page=2))



**Lara Backer, Ph.D. student in Professor Perrine Pepiot's research group** received the 2016 Charles P. Fenimore Best

Student Presentation Award, for her paper entitled "Numerical investigation into the auto-ignition of a multicomponent fuel spray," presented at the 2016 Spring Technical Meeting of the Eastern States Section of the Combustion Institute (ESSCI). ([http://www.mae.cornell.edu/mae/news/spotlights.cfm?s\\_id=697&page=2](http://www.mae.cornell.edu/mae/news/spotlights.cfm?s_id=697&page=2))



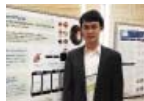
**Micro-g NEXT, a Cornell Engineering team**

advised by Dr. Ana Diaz-Artiles releases a video highlighting their research. ([https://drive.google.com/a/cornell.edu/file/d/0B\\_DQ4RXho2OUdzJZc21X-MDdvR2s/view?usp=drive\\_web](https://drive.google.com/a/cornell.edu/file/d/0B_DQ4RXho2OUdzJZc21X-MDdvR2s/view?usp=drive_web))



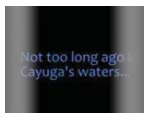
**This pulsating 'Haptic Skin' is somewhat creepy, mostly awesome:** Omnipulse is a

new haptic technology out of Cornell's Organic Robotics Lab which uses an array of embedded pneumatic actuators to create haptic feedback which feels quite 'organic' compared to the more 'mechanical feel' of many other haptic technologies out there. (<http://www.roadtovr.com/omnipulse-haptic-skin-organic-robotics-lab-virtual-reality/?platform=hootsuite>)



**Xiangkun (Elvis) Cao wins 2017 Biotech Symposium Best Poster Award:** Cao, a Ph.D.

student in Professor Erickson's lab, won 1st place at the 9th annual New York State Biotechnology Symposium. ([http://www.mae.cornell.edu/mae/news/spotlights.cfm?s\\_id=702&page=2](http://www.mae.cornell.edu/mae/news/spotlights.cfm?s_id=702&page=2))



**A tradition since 2001... and almost each year since:** The

mechanical engineering seniors have made a video as a class gift to their classmates. Here's this year's video (<https://www.youtube.com/watch?v=lf4lwESbezs&t=2s>)



**ASME—MECHANICUS Volume 7, Issue 3— May 2017 edition:**

Resistance Racing Pulls Up to the Curb With Fresh Ideas; Emissions & Cleaner Power Systems with Dr. Max Zhang. ([http://auth.cengr.commonspotcloud.com/mae/news/upload/Mechanicus\\_vol7issue3.pdf](http://auth.cengr.commonspotcloud.com/mae/news/upload/Mechanicus_vol7issue3.pdf))



**CUAIR achieves 2nd place** Pat 2017 Association for Unmanned Vehicle Systems International Student Unmanned Aerial

Systems (AUVSI SUAS) Competition. ([http://www.mae.cornell.edu/mae/news/spotlights.cfm?s\\_id=709&page=1](http://www.mae.cornell.edu/mae/news/spotlights.cfm?s_id=709&page=1))



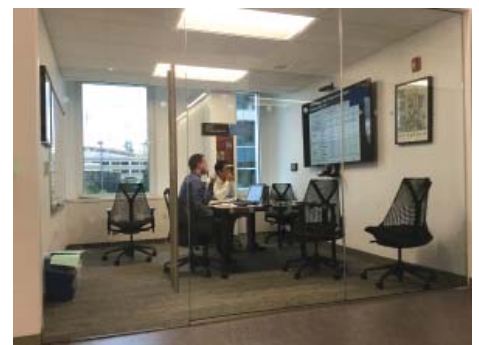
Artist Rendition before construction: 'Monumental Staircase', Upson Hall 1st floor.



After construction: 'Monumental Staircase', Upson Hall 1st floor.  
Image by: Michael Moran Photography.



Upson Hall 1st floor entrance (Hoy Road).



Small conference room, Upson Hall 3rd floor.



## LOWELL C. McADAM '76

CHAIRMAN AND CEO OF VERIZON COMMUNICATIONS

portunity, nervous about such a big life change, and excited about all of the possibilities that lie ahead," said McAdam.

After making the move out West, he attended the University of San Diego and received a master's degree in business administration. McAdam then joined a branch of the U.S. Navy known as the Seabees which is the Navy's engineering and construction unit, serving in Guam, Okinawa, the Philippines and San Diego. After spending six years with the Seabees and becoming a licensed engineer in 1979, McAdam completed his public service and started life as a private sector engineer.

McAdam is now revered as one of the architects of today's global wireless industry, having built wireless businesses on three continents since the technology's development in the 1980s. Before his current post, McAdam was president and CEO of Verizon Wireless (2007 until 2010) and before that served as its executive vice president and chief operating officer. Prior to joining Verizon Wireless in 2000, McAdam was president and CEO of PrimeCo Personal Communications, a joint venture owned by Bell Atlantic and Vodafone AirTouch,

where he oversaw the deployment of one of the industry's first all-digital networks. He also served as vice president-international operations for AirTouch Communications and was lead technical partner for cellular ventures in Spain, Portugal, Sweden, Italy, Korea and Japan. Prior to joining AirTouch in 1993, he held various executive positions with Pacific Bell.

McAdam also serves on the Cornell University Board of Trustees, where he chairs the Cornell Tech Board of Overseers and sits on the executive committee. He also serves on the General Electric Board of Directors.

In 2013, McAdam endowed Cornell with the Lowell & Susan McAdam Professor of Heart Assist Technology Professorship with the Schools of Biomedical Engineering and Mechanical & Aerospace Engineering in honor of his late wife, Susan. The research focuses on dramatically enhancing cardiovascular research to develop solutions to problems in human cardiovascular health and disease. Since its founding, the professorship has evolved and in 2017 two faculty members were hired, both in BME, James Antaki and Yadong Wang.

**L**owell C. McAdam is the chairman and CEO of Verizon Communications, a leading provider of wireless, fiber-optic and global internet networks and services. Born in Buffalo, New York, Lowell graduated from a small high school in Barker, New York and joined the student body of Cornell in 1972 on an ROTC Navy Scholarship. After graduating in 1976 with a bachelor's degree in engineering, McAdam moved to California, which he remembers as "a pretty big deal" to a then 22 year old, "One that had me feeling grateful for the op-

## FONDEST **MEMORY** AT **CORNELL**

**"THE ROTC COMMUNITY WAS VERY IMPORTANT TO ME. FROM GOING TO CORNING TO HELP WITH FLOOD RELIEF TO ACCLIMATING NEW FRESHMAN INTO THE PROGRAM EVERY YEAR, WE BANDED TOGETHER AND HAD EACH OTHERS' BACKS. LUCKILY I'M STILL CLOSE WITH TWO OF MY ROTC ROOMMATES FROM SOPHOMORE YEAR, SO THE COMMUNITY-BUILDING CONTINUES TO THIS DAY."**



Throughout every stage of his collegiate life, military service and professional career, McAdam has lived by somewhat of an internal credo that he still adheres to today.

1) **Your integrity is everything.**

"It's at the core of who you are as a person. It builds trust, and trust is nearly impossible to regain, in any relationship, once it's lost ... Your integrity is your brand and just like brands in the business world, your individual brand takes years to build and seconds to destroy."

2) **Trust your gut...and act.**

"In life and in business, we can (over) analyze everything forever. Don't get me wrong, educating yourself will always be important. But here's the reality: we'll never have perfect information. The times when we feel we actually do have perfect information are, ironically, the times when we can get ourselves into the most trouble. The biggest mistakes I've made in my career – and the hardest ones to recover from – are when I've ignored my intuition or failed to act on my convictions ... gather your information, test it with your intuition, and then act with urgency ... anything else is abdicating your role as a leader."

3) **You always have a higher gear.**

"Every day is a new opportunity ... if you surround yourself with the best people and expect that they can deliver well beyond what you might think, you will help them become all they can."



# THE NEW UPSON HALL

**U**pson Hall, home to the Sibley School, was built in 1956. Understanding that the continuous development of technology shapes the future, Upson Hall has been completely updated, top to bottom from walls to wires. Guaranteeing that the mechanical and aerospace engineers at Cornell remain at the forefront of innovations in fields as diverse as medical technology and space exploration. The building has a state-of-the-art Robotics Facility, an entire floor devoted to Student Project Teams, seven collaboration spaces, specialized hybrid research areas—including a drop tower and a wind tunnel—and many features designed to enhance the visual facade while greatly increasing the energy efficiency of the building.



Upson Hall exterior facade before construction (Hoy Road).



Upson Hall exterior facade after construction (Hoy Road).



Upson Hall entrance before construction.



Upson Hall entrance after construction.

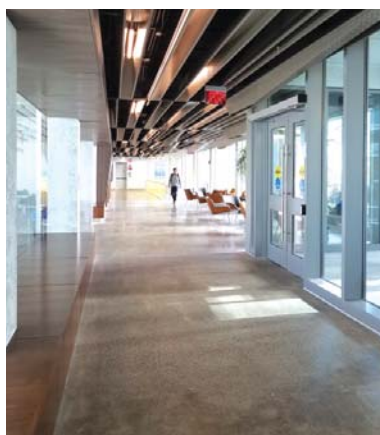
Stop in to see the newly renovated Upson Hall - from the basement to the 5th floor.



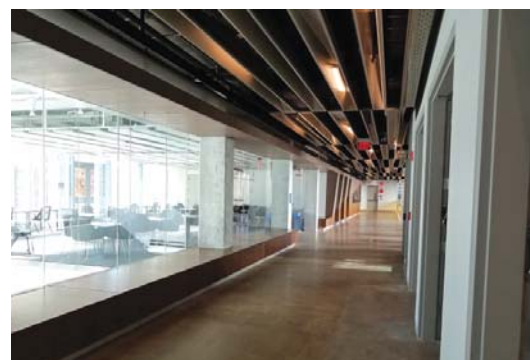
Reuleaux Collection - Upson Hall 1st floor.



Upson Hall 1st floor (A-wing) before construction.



Upson Hall 1st floor (A-wing) after construction.







*The Sibley School of Mechanical and Aerospace Engineering  
Reunion June 10, 2017*



# THE SIBLEY SCHOOL OF MECHANICAL & AEROSPACE ENGINEERING

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On the cover:  
**BREAKING RULES to ENGINEER a ROBOT'S  
BEHAVIOR.** Professor Hadas Kress-Gazit  
leads the Verifiable Robotics Research  
Group.

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