have had the pleasure of serving as director of ECE for almost 12 years, first from 2001-2008, and then again from 2014 to now, but my term is finally ending! I’m excited to announce our new director will be Professor Alyssa Apsel. I encourage you to read more about her on page 19.

I have met over 1,000 ECE alumni (haven’t met a dull one yet) and look forward to hearing more great stories about your student experience and subsequent life. Cornell had a huge impact on your trajectory, and it is fun to hear about these journeys.

A common story I hear is how some of the tough courses alumni took here—whether it was probability from Terry Fine or computer engineering from Norm Vrana—eventually led them to a better solution or deeper understanding of a problem at work. ECE still has a reputation as the hardest major, so perhaps we attract only the bravest of the students, but they make teaching in ECE a lot of fun.

One anecdote I will share occurred this fall. A student in my laser course said she got a phone call from her sister, asking what the term was for exciting an atom in a laser. “Pumping,” she responded, and the sister said “thanks” and hung-up. A while later she got a text explaining the phone call. Her twin sister is a business major at another prestigious university and she was at a bar participating in a trivia contest. The laser question came up, and thanks to her diligent engineer sister, her team was able to answer it correctly and won a $50 prize. I thought this was the perfect analogy for the traditional engineer. The business person calls the studious engineer when she needs help, gets the right answer and walks away with a reward!

But the truth is, our engineers learn to be leaders and entrepreneurs who walk away with their own rewards, both experiential and monetary. And it’s our emphasis on foundational knowledge that empowers them to find answers and rise above the rest (including on trivia nights).

As I reflect on my time as director, I want to point out two major changes that have occurred over the last six years. One is the Cornell Tech campus in New York City. ECE currently has two faculty members there now and is looking to continue hiring until we have perhaps 15-20 faculty there by 2030. It is a great opportunity for us to build an even stronger faculty, make connections to industry in New York City and have a direct connection to entrepreneurial opportunities. Stay tuned to learn more.

The second change occurred with our M.Eng. program. We conscientiously changed the curriculum to include more professional advice and training and added a lot of rigor to the design project. M.Eng. students diligently plan and execute their projects, do lots of team work, make presentations and have to meet a schedule and budget. I believe it is among the best master’s degrees available in the nation today, which was the motivation toward the change. For a sample of the impressive M.Eng. projects, check out our website.

Let me thank each of you for what you have contributed to the legacy of ECE at Cornell. Our culture, position and reputation today are due to the integrated input that each of you had in the classroom, on our faculty, in the research lab and through participation in the many groups that have tutored, sold coffee and donuts and generally added spontaneous life to an otherwise tough curriculum. Please, always stay in touch! I look forward to future connections with all of you.

Sincerely,

Clif Pollock
# INSIDE THIS ISSUE

| ECE News | ................................................................. | 2 |
| Teaching Snapshot: Kirstin Petersen | .................. | 8 |
| New Faculty: Mahsa Shoaran | .................................. | 12 |
| New Faculty: Mert Sabuncu | .................................. | 13 |
| Feature Article: ECE Women | .................................. | 14 |
| New Director: Alyssa Apsel | .................................. | 19 |
| Feature Article: Data On The Brain | .................. | 20 |
| Alumni Spotlight: Susie Kim Riley ’87 | .................. | 22 |
| Awards: Faculty / Student Awards & Honors | ............ | 24 |

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# WHAT KIND OF IMPACT WILL YOU MAKE?

Your gift directly impacts our student’s learning environment and our faculty’s research. And your support is critical to improving teaching spaces where our students learn, updating lab facilties where our faculty members conduct research, and renewing social spaces where both students and faculty interact outside of the classroom.

Some giving opportunities are below, and you can find a comprehensive list at:

www.ece.cornell.edu/alumni/support.cfm

**Graduate Student Support:**
Research funding for our faculty often requires matching funds for graduate student support. These graduate students are the future leaders of our technology economy, so it is critical for the nation, and for Cornell’s ranking, that we attract and recruit the right students to our program.

**Upgrade the Circuits Labs:**
Circuits have changed dramatically since Phillips Hall was first opened. At that time one large room was devoted to supporting a large IBM computer, and as much time was devoted to designing vacuum tubes as to the emerging solid state revolution. Phillips Hall was built with these large dedicated instruments in mind, but has evolved to match the times. We have been slowly upgrading some spaces, and need to complete the renovations to unify the space. Our analog circuit program is one of the most active in the world, and we want to provide the right facility to make their impact the largest in the world.

**Robotics Lab:**
Robotics is one of our priorities for the future of the school. Support for this lab will help our students learn to build robots from the ground up.

**Revitalize Office Space:**
Phillips Hall was built in 1955 with three floors of identically sized offices. We want to modernize the 3rd floor office to be aligned on the beams of the building, yielding 200 sq. ft. rooms that will better accommodate center administration, graduate students and TA meeting rooms for class support. The upgrade will also allow better power and HVAC upgrades so that window air conditioners will not be needed. The offices will be constructed with some form of window to enliven the entire hallway with natural lighting and activity.

**Graduate Student Electronic Devices Society (EDS) Seminars and ECE Colloquium Series:**
These events regularly bring our faculty and students together to stay on top of developments inside and outside of our field and create a continued sense of community across the school.

For more information, contact:

Hilary Diekow

had1@cornell.edu
Engineers scrap the stethoscope, measure vital signs with radio waves

Edwin Kan, professor of electrical and computer engineering at Cornell, holds a radio frequency identification tag.

No visit to the doctor’s office is complete without a blood-pressure cuff squeezing your arm and a cold stethoscope placed on your chest. But what if your vital signs could be gathered, without contact, as you sit in the waiting room or the comfort of your own home?

Cornell engineers have demonstrated a method for gathering blood pressure, heart rate and breath rate using a cheap and covert system of radio-frequency signals and microchip “tags,” similar to the anti-theft tags department stores place on clothing and electronics.

The cracker-sized tags measure mechanical motion by emitting radio waves that bounce off the body and internal organs, and are then detected by an electronic reader that gathers the data from a location elsewhere in the room.

The system works like radar, according to Edwin Kan, professor of electrical and computer engineering. But unlike most radar systems that rely solely on radio waves to measure movement, Kan’s system integrates “near-field coherent sensing,” which is better at directing electromagnetic signals into body tissue, allowing the tags to measure internal body movement such as a heart as it beats or blood as it pulses under skin.

The tags are powered by electromagnetic energy supplied by a central reader, and because each tag has a unique identification code it transmits with its signal, Kan said up to 200 people can be monitored simultaneously using just one central reader.

“If this is an emergency room, everybody that comes in can wear these tags or can simply put tags in their front pockets, and everybody’s vital signs can be monitored at the same time. I’ll know exactly which person each of the vital signs belongs to,” said Kan.

Kan and his graduate student, Xiaonan Hui, plan to do more extensive testing with Dr. Ana Krieger, medical director of the Center for Sleep Medicine and associate professor of clinical medicine, of medicine in clinical neurology and of clinical genetic medicine at Weill Cornell Medicine. They’re also working with professor Jintu Fan and associate professor Huiju Park from Cornell’s Department of Fiber Science and Apparel Design, who have demonstrated a way to embroider the tags directly onto clothing using fibers coated with nanoparticles.

Study: Bigger honeybee colonies have quieter combs

Researchers suspect that the secret to how bees dampen the vibrations in a crowded colony could be in their posture.

When honeybee colonies get larger, common sense suggests it would be noisier with more bees buzzing around.

But a study recently published in Behavioral Ecology and Sociobiology reports that bigger honeybee colonies actually have quieter combs than smaller ones.

“The surprising result was that—and at first I thought something must be wrong—when there are more bees on the comb, the vibrations are actually reduced,” said Michael Smith, a doctoral student in neurobiology and behavior and the paper’s lead author. Po-Cheng Chen, Ph.D. ’16, a former doctoral student in the field of electrical and computer engineering, is a co-author of the paper.

The researchers found the bees actively damp vibrations in the comb, possibly by the way they grasp the combs, though more study is needed to verify the mechanism.

The finding is important because bees communicate with substrate vibrations in the comb. The study underlines the universal need to separate signals from noise in all biological systems—from unicellular organisms sensing their environment to human bodies trying to sense hormone concentrations.
Imagine walking through the Northwest wilderness, camera phone at the ready, hoping to catch at least a faint glimpse of Bigfoot, and instead returning home with an Ansel Adams-quality picture of the mythical beast as he lumbers past you.

That’s kind of what a team led by physics professor Paul McEuen has done in research into the optical properties of single-atom-thick layers of graphene.

Combining the technical strengths of two Kavli Institute postdoctoral fellows, as well as measuring tools from the lab of electrical and computer engineering professor Farhan Rana, the group reports remarkably clear observations of excitons—electrically neutral quasiparticles—in bilayer graphene.

And the excitons’ unique properties and behavior make this material of possible interest in the development of optoelectronic devices, including lasers.

Exhibition, research project highlight learning from Rembrandt’s art

Rembrandt van Rijn’s art and artistic practice have fascinated scholars and collectors for centuries. His printmaking methods, and prints from across his career, are revealed as an inspirational resource for research and teaching in a new exhibition of his etchings at the Herbert F. Johnson Museum of Art.

Watermarks are unique to each batch of paper the artist used, and can often confirm the date or edition of specific impressions. As part of the WIRE (Watermark Identification in Rembrandt’s Etchings) project at Cornell, students have been tasked with creating an online decision tree as a computational tool, which, when completed, will allow users to quickly and confidently identify watermarks from among the 54 main types and more than 500 known subvariants that appear in Rembrandt’s oeuvre, printed from some 300 plates in all.

Andrew C. Weislogel, the museum’s curator of earlier European and American art, directs the project with C. Richard Johnson Jr., the Geoffrey S.M. Hedrick Senior Professor in the School of Electrical and Computer Engineering and the Fellow in Computational Arts and Humanities at the Jacobs Technion-Cornell Institute. Johnson’s extensive prior computational art history projects have involved research on thread counting in canvases and chain lines and laid lines in pre-1800 papers.

Students in Weislogel and Johnson’s courses at the museum on Rembrandt’s etchings use radiographs of original prints in developing and expanding the computer-assisted decision tree for classifying watermarks, based on the work of Rijksmuseum curator and Rembrandt scholar Erik Hinterding, whose 2006 three-volume series has been the definitive source.
Experiment aboard space station studies ‘space weather’

For Steven Powell, the weather he’s interested in can’t be felt by humans or measured by barometric pressure.

Powell, research support specialist in electrical and computer engineering, is concerned with “space weather”—charged particles in the plasma of space, on the edge of the Earth’s atmosphere. These particles affect the performance of communications and navigation satellites.

To study conditions in the ionosphere, a band between 50 and 600 miles above the Earth, Powell and others in the College of Engineering have developed the FOTON (Fast Orbital TEC for Orbit and Navigation) GPS receiver, which was built in a Rhodes Hall lab. In 2017, the FOTON hitched a ride aboard the SpaceX Falcon 9 rocket to begin a long-term project at the International Space Station.

The project, which could last two years, is called GROUP-C (GPS Radio Occultation and Ultraviolet Photometry-Colocated), and is headed by Scott Budzien of the Naval Research Laboratory. Powell is the Cornell principal investigator for the project. Also contributing was the late electrical and computer engineering professor Paul Kintner, who died in November 2010. Kintner was responsible for the original ionospheric research that formed the scientific basis for GROUP-C, Powell said.

The FOTON is a highly sensitive GPS receiver, designed to withstand the rigors of spaceflight while detecting subtle fluctuations in the signals from GPS satellites.

“These fluctuations help us learn about the ionosphere in which the signals travel,” said Powell, who returned to Ithaca in early March after spending six weeks in Alaska on a project to send two sounding rockets into the aurora borealis, also to study the ionosphere.

“These fluctuations are typically filtered out by standard GPS receivers,” he said, “but they are the scientific ‘gold nuggets’ in the data analysis process.”

Powell’s experiment is one of a number of projects studying the Earth’s atmosphere and ionosphere. It shares a mounting palette on the outside of the ISS, receives power from large solar arrays, and uses the data communications system onboard the station to quickly distribute data back to Earth.

Engineers devise two-way radio on a single chip

Two-way communication requires, of course, both send and receive capabilities. But putting them in the same device requires a filter between the send and receive circuits to provide signal isolation.

Without a significant filter, communication would be impossible.

“Your transmit signal is $10^{14}$ times stronger than your receive signal,” said Alyosha Molnar, associate professor of electrical and computer engineering (ECE). “That’s 10 trillion times stronger—that’s a really hard problem.”

But researchers in Molnar’s lab have offered up a solution.

Molnar and collaborator Alyssa Apsel, professor of ECE, have devised a method for both transmitting and receiving a radio signal on a single chip, which ultimately could help change the way wireless communication is done.

Their idea lies in the transmitter—actually a series of six subtransmitters all hooked
Group blazes path to efficient, eco-friendly deep-ultraviolet LED

Members of the Jena-Xing Research Group—Debdeep Jena, Moudud Islam, Huili (Grace) Xing, Vladimir Protasenko, Kevin Lee and Shyam Bharadwaj—are pictured in front of one of the molecular beam epitaxy systems used in their latest work.

The darkest form of ultraviolet light, known as UV-C, is unique because of its reputation as a killer—of harmful organisms.

With wavelengths of between 200 and 280 nanometers, this particular form of UV light penetrates the membranes of viruses, bacteria, mold and dust mites, attacking their DNA and killing them.

Currently, most deep-UV lamps are mercury-based. They pose a threat to the environment, and are bulky and inefficient. A Cornell research group led by electrical and computer engineering professors Huili (Grace) Xing and Debdeep Jena, along with collaborators from the University of Notre Dame, has reported progress in creating a smaller, more earth-friendly alternative.

Using atomically controlled thin monolayers of gallium nitride (GaN) and aluminum nitride (AlN) as active regions, the group has shown the ability to produce deep-UV emission with a light-emitting diode (LED) between 232 and 270 nanometer wavelengths. Their 232-nanometer emission represents the shortest recorded wavelength using GaN as the light-emitting material. The previous record was 239 nanometers, by a group in Japan.

Postdoctoral researcher SM (Moudud) Islam, the lead author, said: “UV-C light is very attractive because it can destroy the DNA of species that cause infectious diseases, which cause contamination of water and air.”

Now that the group has proven its concept of enhanced deep-UV LED efficiency, its next task is packaging it in a device that could one day go on the market. Deep-UV LEDs are used in food preservation and counterfeit currency detection, among other things.

Further study will include packaging both the new technology and existing technologies in otherwise similar devices, for the purpose of comparison.
Cornell projects to cultivate digital agriculture landscape

Expanding on Cornell’s digital agriculture initiative, a slate of six projects totaling more than $1 million will generate innovative research in the intersecting fields of agriculture, computation and engineering.

Research investment from the Cornell University Agricultural Experiment Station (CUAES) will fund six proposals over three years focused on developing computational and informational technologies to create more profitable, efficient and sustainable agricultural practices.

Among the projects is “Improving Vineyard Management Using Touch-Sensitive Soft Robots,” led by Kirstin Petersen, assistant professor of electrical and computer engineering, and Justine Vanden Heuvel of the College of Agriculture and Life Sciences. Amit Lal, the Robert M. Scharf 1977 Professor of Engineering in ECE is also involved with the project, which will apply inexpensive robots that can touch, sense and manipulate fragile agricultural products to collect data on grape yield and quality.

‘Revolutionary’ Cornell Tech campus in NYC dedicated

With luminaries and Cornell power players aplenty, and pomp-and-circumstance befitting such a historic occasion, Cornell officially strengthened its already sizable New York City presence Sept. 13, 2017, with the dedication of the glittering, futuristic Cornell Tech campus on Roosevelt Island.

“In academic terms, Cornell Tech has been created in record time—from vision to reality in just a few short years,” said Cornell President Martha E. Pollack. “In another way, Cornell Tech has been a long time in the making—building on a century of Cornell teaching, research, patient care and service to New York City and tracing back to our land-grant roots.

“Yet this moment is more than just a continuation; it’s a transformation—for Cornell and for New York City,” she said. “And I believe that Cornell Tech will be transformative in every way.”

Less than six years after winning then-New York City Mayor Michael R. Bloomberg’s contest to submit plans for an applied sciences and engineering campus, Cornell Tech is up and running. The winning proposal that spawned Cornell Tech was a joint submission, Cornell partnering with the Technion—Israel Institute of Technology. Phase One of the three-phase construction process is near completion, and academic activity began last month on the sparkling, sustainability-driven campus. Completion of the full campus is expected in 2043.

The dedication—held in a massive climate-controlled tent on the campus lawn—began with a short introductory video, followed by a welcome
from Cornell Tech’s founding dean and vice provost, Dan Huttenlocher, who was recently named the Jack and Rilla Neafsey Dean of Cornell Tech. During his remarks, he explained the significance of the day’s theme: the partnership between Cornell Tech and the community.

That bond was represented by four community pillars—interconnections between academia and industry; economic development; New York City; and institutional leadership—and carnelian banners that linked them and the university together.

As former Mayor Michael Bloomberg, New York Gov. Andrew Cuomo and Mayor Bill de Blasio took the stage to deliver their respective remarks, community leaders representing each of the four pillars carried long banners in front of the stage and handed them to students offstage.

“The connective thread through all of this is tremendous dedication, and many of the ribbon-bearers are those who’ve shown that dedication,” Huttenlocher said. “That has enabled us to develop this project at warp-speed, even by industry standards, much less a partnership between academia and government, which this campus is.”

After the final speech, the VIPs were invited back on stage for the ceremonial ribbon-cutting. A white ribbon adorned with the Cornell Tech logo was stretched across the stage, and following a drum roll and countdown, the ribbon was cut as confetti cannons shot streamers into the air.

Cornell Tech officially was declared open—for academia, as well as for business.

Engineers create new architecture for vaporizable electronics

Engineers from Cornell and Honeywell Aerospace have demonstrated a new method for remotely vaporizing electronics into thin air, giving devices the ability to vanish—along with their valuable data—if they were to get into the wrong hands.

This unique ability to self-destruct is at the heart of an emerging technology known as transient electronics, in which key portions of a circuit, or the whole circuit itself, can discreetly disintegrate or dissolve.

Cornell engineers have created a transient architecture that evades the drawbacks of existing techniques for triggering the vaporization by using a silicon-dioxide microchip attached to a polycarbonate shell. Hidden within the shell are microscopic cavities filled with rubidium and sodium bifluoride—chemicals that can thermally react and decompose the microchip.

Ved Gund, Ph.D. ’17, led the research as a graduate student in the Cornell SonicMEMS Lab, and said the thermal reaction can be triggered remotely by using radio waves to open graphene-on-nitride valves that keep the chemicals sealed in the cavities.

“The encapsulated rubidium then oxidizes vigorously, releasing heat to vaporize the polycarbonate shell and decompose the sodium bifluoride. The latter controllably releases hydrofluoric acid to etch away the electronics,” said Gund.

Amit Lal, the Robert M. Scharf 1977 Professor of Engineering, said the unique architecture offers several advantages over previously designed transient electronics, including the ability to scale the technology.

“The stackable architecture lets us make small, vaporizable, LEGO-like blocks to make arbitrarily large vanishing electronics,” said Lal.

Lal, Gund and Honeywell Aerospace were recently issued a patent for the technology, and the SonicMEMS Lab is continuing to research new ways the architecture can be applied toward transient electronics as well as other uses.
ECE 3400 has changed hands several times over the years, each instructor putting their own mark on the class. Now called Intelligent Physical Systems, ECE 3400 students learn to tie the fundamental principles of ECE across virtual and physical boundaries to create autonomous robots able to perceive, reason about and act upon their environment. In teams of five or six, students design and fabricate a robot able to navigate and map out a maze and find treasures in the shortest possible time, while wirelessly transmitting the progress of the robot to a base station that displays their progress on a screen.

Course topics include microcontrollers, field programmable gate arrays (FPGAs), wireless communication, sensors, signal processing, actuators, power, algorithms and mechanics. Throughout the class, students learn the value and trade-offs between theory, simulation and physical implementations, and gain familiarity with rapid prototyping techniques, system debugging, team work, leadership skills, time management and how to disseminate work to an online audience.

Between course development and teaching, as well as a busy research lab, Assistant Professor Kirstin Petersen was able to find time throughout the semester to update ECE Connections on her new approach. Here are her updates:

**August 29**

We have 98 students right now and they’re still showing up to class, which is nice because lectures are not mandatory. The class is very much about teamwork, so we’ve been stressing that point. We made very deliberate teams according to the Belbin test with the help of Kathy Dimiduk from the Center for Teaching Excellence. An algorithm was written to create teams that included someone with each personality type, as well as gender and minority status, so we have a whole range of diversity on each team. The teams are also made aware of their strengths and weaknesses so that they can address them openly throughout the semester.

This week they’re starting their first lab, setting up with Arduino, putting together robots. I gave a hands-on lecture last week where we took the simplest possible Arduino program and took it apart all the way down to low-level setup of timers and memory allocation. I showed them all the things that go on behind the
curtain. They may never touch this again, but they’re ECE students, and they should know the foundations so they can build on them.

Next week my TAs are reviewing sensors and analog circuitry. It’s going to be interactive—we’re actually going to bring in an oscilloscope, try out the sensors, show the signals, and discuss interface with the Arduino, signal-to-noise ratio, amplification, filters and similar. We’re encouraging everyone to get their hands dirty. We want them to just dive in and do it.

**September 12**

We now have 17 robots running (out of 17 teams), all of them are doing line following and some can detect a cross section, so they are starting to get smarter. This week the students are starting to implement analog circuits, amplifiers and digital filters, which will allow the robots to distinguish between treasures at different frequencies.

A single lab assignment is not enough for six students to engage at once. Instead, we have divided the assignments into two similar, but different tasks that will bring the teams closer to their final robot. Right now, one sub team is working on detecting treasures and the other sub team is on audio—the robot has to detect an audible start signal of a specific frequency to start the maze. Students are starting to realize that memory on board a tiny embedded processor is not the same as it is on their computer; these and other constraints from the embedded system are teaching them to write more efficient software.

We’re trying to show students different areas of the department as well. We invited different teachers to come and give a lecture related to future relevant 3- and 4000 level courses. For example, ECE Senior Lecturer Joe Skovira just gave a pitch on ECE 5725 Design with Embedded Operating Systems. Tomorrow, one of my TAs will give a lecture that is more applied to answer questions like, “If I program my robot in this way, it takes up all of the memory. How do I manage memory and write a clean software architecture?”

**October 13**

The teams all have clever robots now that can drive around and navigate the maze grid. They have their analog circuitry done, so they can sense walls, they can see treasures from far away, they can hear the start signal. Senior Lecturer Bruce Land gave the first lecture on field-programmable gate arrays (FPGA) last week and everyone loves him. The following day one of my TAs gave a lecture on how to make the FPGA work with the screen, so that is what all the students are worried about now.
The teams have started their visual maze mapping on the screen and digitizing a signal that plays a victory tune when the robot has completed the maze. We’re working on mechanical prototyping and we reviewed different manufacturing techniques including manual fabrication, as well as additive and subtractive manufacturing. We also included some very basic topics, like intuition for what type of screws and glues to use dependent on material and stresses; which, if no one teaches you, you don’t stand a chance to learn. After that lecture, there was more interest in using the prototyping lab where they have open access to 3-D printers and laser cutters. Tomorrow, another TA will give a lecture on how to use a laser cutter, how to design parts in AutoCAD and how to use the 3-D printer.

Some of them have just gone crazy with their websites and they’ve picked their own team names. Team Resistance made their site Star Wars-themed, with the mouse turning into BB8 and then changing into a light saber when you hover over a link. Team Firework included a game on their site and created overview videos for their lab assignments. Team 1, the One-ders!, have made a hilariously funny website describing their mental state before, during and after every lab. At the start of the semester I gave a lecture about online communication and targeting your audience, but I never thought they’d put in this much effort. It is clear that they realize that they can use these websites later as a reference on their resume.

**October 24**

Algorithms is the next big topic, and I also promised the students to do two lectures in which we debug their systems live, which is fun and terrifying. I’m trying to figure out how to show formal debugging of these intelligent systems when there are so many parameters across electronics, software and mechanics that can fail. We need to come up with some examples that are sort of cryptic and yet show the procedure.

I had a TA do a talk on printed circuit board (PCB) design, and she did a fantastic job. It’s optional, but nine of the 17 teams are going to try to make circuit boards and we’re going to send them out for fabrication. It is not necessary to have a functional robot, but it will make the wiring a lot cleaner. The FPGA part of the challenge is also going really well, actually. Everyone has debugged their way through the last lab and they’re working on the third of four milestones now, where their robot has to search through the maze. They’re starting to pull things together.

We’ve started making catalogs of common mistakes and common debugging issues, which was something the students suggested. They’ve really grasped this concept of making something bigger than themselves, making something that future years can take and move on. It’s great to see.

**November 9**

Now we’re doing ethics lectures. We did a full lecture on the Volkswagen scandal and the short- and long-term pros and cons of demanding open-source software. They have learned to identify all the stakeholders and apply utility, justice and virtue tests. They also have homework in which they will have to pick their own problem rooted in an actual article or event. The submission can be anything—an essay, a song or dance, a short video, but it has to include all the relevant content.

Milestone three is due this week, and that involves having the robot traverse a maze in simulation and in real life. About half the teams actually completed the milestone. However, we told them up front that it wasn’t just about making the goal, but about realizing what needs to be done over the next few weeks leading up to the final competition.

One of the teams showed me their base station yesterday; they managed to use my photo as the robot on the screen. It must have taken so long for them to do that but, hopefully that indicates that they are having fun.
It’s the last week of classes, and I actually feel really good. Very few people are now showing up to class, but the lab is packed continuously and the TAs keep it open 10 hours a day. Almost all the teams have their own PCBs, they’re printing mechanical components, they’re laser cutting, they’re making team logos, they’re really getting into it. There are some very unorthodox robots. Some teams that went for the really ambitious robots are now realizing they may have pushed their limits a little bit, but that’s a good experience to have.

December 8

Competition day was a ton of fun. Fifteen of the 17 teams completed at least one maze during the competition. There were also a few curve balls. One of our strongest teams had a robot that was very sensitive to the start tone; it was sitting on their table powered up and then proceeded to drive off the table when another team tested their speakers. It caused some last minute panic, but they made it to the final round anyway.

We’re engineers, so we constantly look at things we can improve. At the competition, everyone had all of the working subcomponents, but we had let the teams manage the integration on their own, and so when the components had to work all at once, a lot of them didn’t.

It’s clear now that we have to push that integration more next year. We told them again and again, but we need to rethink things, either give no deadlines at all so they’re on their own and have to take responsibility, or give all the deadlines up front.

Looking at the bigger picture, I think we need ECEs with a broad tool set. We need students who can sit down with an interdisciplinary team in the face of an overwhelming challenge and break it up into achievable subgoals, even if some of those subgoals are completely outside their area of comfort like mechanics and design of algorithms. I think robotics is a great means to teach them that and I think this class did that too. It forced them to try to design with the kind of holistic mindset that often leads to practical society-changing innovations. By teaching them these skills, I also think somehow you create more well-rounded and holistic people.

“THEY’VE REALLY GRASPED THIS CONCEPT OF MAKING SOMETHING BIGGER THAN THEMSELVES, MAKING SOMETHING THAT FUTURE YEARS CAN TAKE AND MOVE ON. IT’S GREAT TO SEE.”

— Kirstin Petersen

November 30

It’s the last week of classes, and I actually feel really good. Very few people are now showing up to class, but the lab is packed continuously and the TAs keep it open 10 hours a day. Almost all the teams have their own PCBs, they’re printing mechanical components, they’re laser cutting, they’re making team logos, they’re really getting into it. There are some very unorthodox robots. Some teams that went for the really ambitious robots are now realizing they may have pushed their limits a little bit, but that’s a good experience to have.

Some of the teams are ready for the competition, but most of them still have a lot of work to do. Each team will get to run through the maze twice and the six best teams will run in a final round. The scoring is based on time through the maze and accuracy: if they knock over a wall, if they respond to the start signal tone, if they find all of the treasures. There are prizes for the winners of the competition and there are awards for best website, best robot design, best teamwork and best ethics homework. The winners will get t-shirts and trophies; we also have website badges for teams to show that they won.

Students and TAs work together during the ECE 3400 competition in Duffield Hall.
Mahsa Shoaran was born into a family of medical doctors. Through most of her early schooling, she believed she was on that same path toward a medical degree. But then came higher-level math and physics courses in high school. Shoaran liked these classes and found she was good at them. She started to consider that there might be ways to help people other than by becoming a doctor. “I knew from watching the doctors in my family that it can be very rewarding to help people who are suffering,” says Shoaran. “But as I started to learn about electronics and the broad application of integrated circuits in other fields such as life science and medicine, I saw that maybe I could do the same thing without going to medical school.”

Shoaran decided to major in electrical engineering at the Sharif University of Technology in Tehran where she earned her B.Sc. and her master’s degree in microelectronics. She then went to the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland for her doctoral studies. While at EPFL, Shoaran designed circuits for neural interfaces and worked closely with neurologists and neurosurgeons.

Shoaran joined the faculty of the School of Electrical and Computer Engineering (ECE) at Cornell in the fall of 2017 after completing her postdoctoral fellowship at the California Institute of Technology.

“My research here is focused on using engineering approaches, particularly circuit design, signal processing and machine learning, to build smart implantable and wearable devices that can be used in early diagnosis and treatment of medication-resistant neurological disorders, as well as neural prosthetics for paralyzed patients,” says Shoaran.

There are many neurological disorders that are either fully- or partially-resistant to medicines. The list of these conditions includes Parkinson’s disease, chronic migraines, certain types of epilepsy and Alzheimer’s disease. Shoaran hopes to create low-power, miniaturized devices to both diagnose and treat these debilitating diseases.

“I am so excited to be at Cornell,” says Shoaran. “There is the Neurotech initiative and Cornell Tech and the researchers and doctors at Weill and so many people doing strong research all around the campus in so many departments. I am thrilled about the possibilities.”

Shoaran’s Neuroengineering Lab at Cornell brings together circuit design, machine learning and neuroscience in an effort to achieve her long-held goal of helping people who are suffering.

“One of the things I like best about my work,” says Shoaran, “is that I can make devices that help people who currently have no treatment options. In addition, there are so many problems that have not yet been studied. Engineers can make such an impact across so many medical conditions.”

Shoaran will be teaching Introduction to Neural Engineering (ECE 5040) in the spring semester of 2018. “It covers various topics in this exciting area of research and I am looking forward to it,” says Shoaran. “I enjoy teaching and mentoring talented students and this will give me a chance to help people discover a field with so much potential.”

“One of the things I like best about my work is that I can make devices that help people who currently have no treatment options.”
— Mahsa Shoaran
MERT SABUNCU

Mert Sabuncu has joined the faculty of the School of Electrical and Computer Engineering (ECE) and the Nancy E. and Peter C. Meinig School of Biomedical Engineering (BME) at Cornell. Sabuncu, who is interested in implementing innovative tools for analyzing biomedical images, was most recently in a faculty position at Harvard’s A.A. Martinos Center for Biomedical Imaging at Massachusetts General Hospital.

The Sabuncu Lab conducts research in the field of biomedical data analysis, in particular imaging, with an application emphasis on neuroscience and neurology. Their work draws on image processing, probabilistic modeling, statistical inference, computer vision, computational geometry, graph theory and machine learning.

Sabuncu did not discover this interest in computer vision and image processing until he was an undergraduate at the Middle East Technical University in Ankara, Turkey. But it was clear long before college that Sabuncu would be a scientist.

“Even as a child I was drawn to science and engineering,” says Sabuncu. “As a teenager, I knew that I wanted to be a scientist. I am a very curious person and I tend to pick a topic and devour it. I cannot imagine any other profession working for me as well as academia does.”

After earning his B.S. in electrical engineering, Sabuncu went to Princeton University, where he pursued a Ph.D. in electrical engineering. At Princeton he worked on algorithms to process brain MRI scans. During his Ph.D., Sabuncu also interned with Siemens Corporate Research, which exposed him to a range of biomedical applications. From Princeton, Sabuncu took a postdoctoral research position at MIT in the lab of Polina Golland in the Computer Science and Artificial Intelligence Laboratory. After three years at MIT, Sabuncu joined the faculty of Harvard’s A.A. Martinos Center for Biomedical Imaging at Massachusetts General Hospital.

Sabuncu is excited to be at Cornell. He sees opportunities for collaboration with many researchers already doing work here, including investigators in Ithaca studying neural systems of a diverse set of organisms and clinical radiologists at Weill Cornell Medical in NYC. These colleagues are creating interesting and novel data sets and Sabuncu says he is eager to help develop methods to handle, analyze and learn from these data.

One early collaboration with BME professors Chris Schaffer and Nozomi Nishimura has proven successful. Sabuncu and colleagues have created a computer vision algorithm to automatically annotate data that had previously required tedious human effort. Speeding up this annotation process promises to unclog a bottleneck in the flow of data that was slowing down Schaffer and Nishimura’s work aimed at understanding Alzheimer’s disease more fully.

Sabuncu says one of the things he loves about coding is that it gives him tools to translate theoretical ideas into something that works in reality. “Software is suitable to exploring practical implications of theoretical frameworks,” says Sabuncu. “I have always been drawn to the theoretical…yet mathematical abstractions are primarily interesting in the way they relate to real-world problems.”

Sabuncu will have many chances to explore the practical implications of his theoretical frameworks in his position as a co-principal investigator in the NeuroNex hub created at Cornell through a $9 million grant from the National Science Foundation. The hub will develop new imaging tools to look deep into the brain. These tools will collect enormous amounts of data and it is Sabuncu’s task to develop novel algorithmic technology to make sense of, and exploit, this large-scale biomedical data.

When he is not teaching or working with very large data sets, Sabuncu enjoys reading biographies. “I am fascinated by the effect of chance in our lives,” says Sabuncu. “And by the fact that we seem to be hardwired to ignore it.”
When Kirstin Petersen was an undergraduate at the Odense University College of Engineering in Denmark, she was one of just a handful of women in the entire college.

“It was fine, but you certainly experience the full range of comments and you have to have a strong backbone,” says Petersen, who is now an assistant professor in Cornell’s School of Electrical and Computer Engineering (ECE) where 68 of 192 undergraduates are women.

Petersen says she’s thrilled to see ECE’s undergraduate gender ratio trending upward—35 percent women in 2017 versus just 13 percent in 2012. That’s more than twice the national average, according to the American Society for Engineering Education. And for the first time in Cornell Engineering’s history, the college has admitted a class composed of more women than men, with the Class of 2021 being 51% female.

But just like Petersen’s undergraduate days, electrical and computer engineering is still far from a gender-neutral field. And with that gender inequality comes a number of challenges for women—challenges ECE faculty and others are working to eliminate.

**CHANGING THE CULTURE**

There are several academic studies finding that when male and female scientists engage in team-based activities, they tend to fall into stereotypical behaviors that perpetuate outdated gender roles. So when Petersen heard about some students who were having trouble, she did something that would have been impossible during her undergraduate years—she organized a support community by gathering female students from ECE as well as from the Sibley School of Mechanical and Aerospace Engineering and the Department of Applied and Engineering Physics.

“We really just arranged a coffee hour to let the students know that we are here for them and ready to talk about any issues that may arise. We also made it clear that we are more than happy to...
support any initiatives they feel would help,” says Petersen, who organized the gathering with Hadas Kress-Gazit, associate professor of mechanical and aerospace engineering. Now the group communicates online, but Petersen and Kress-Gazit remain popular confidants for students who can’t find help among their peers.

“One of the things that could improve the climate in STEM academia is formal training for faculty and TAs to handle situations that involve students who feel discriminated against or uncomfortable in a setting,” says Petersen, who adds that not all classroom leaders are prepared to offer more than just lessons from a textbook. “And it’s not just gender discrimination. It spans political views, religion, even socioeconomics.”

ECE dedicated one of its faculty meetings in the fall semester to diversity and inclusion by hosting a university program aimed at creating a dialog about the challenges of working and living together in a diverse world.

Petersen also proposes diversity training for undergraduates, noting the value it could bring to Cornell Engineering’s multicultural landscape and the fact that engineering, by nature, requires strong teamwork skills and an appreciation for teammates of all backgrounds.

**A FOCUS ON RETENTION**

An ongoing challenge in the field of electrical and computer engineering has been the retention of female students. Studies and surveys point to a number of causes, one of which is that women, more than men, seek to have a societal impact through their work. And while electrical and computer engineering provides many pathways to effect change, it’s a broad discipline in which societal impact, from an outsider’s perspective, isn’t as evident as fields that have had more success attracting women, such as environmental and biomedical engineering.

“That’s actually a pretty challenging thing to overcome,” says Huili Grace Xing, professor of electrical and computer engineering.

One solution is to recruit women from other engineering disciplines, which Xing has been in a unique position to do. She also holds a professorship in Cornell’s Department of Materials Science and Engineering (MSE), which has about equal
undergraduate gender representation. Her research combines both fields and she’s used that opportunity to introduce electrical engineering concepts to materials science students.

“The MSE undergraduates perceive us as their parent faculty, so they feel free to approach us and to do work in the lab. We always say ‘yes’ and our door is always open,” says Xing. “We help them to develop early-learning initiatives or research-experience programs to have them funded if they’re interested in pursuing financial aid.”

One field that has been particularly competitive with electrical and computer engineering is computer science. “In computer science, you work primarily with code and a computer. You don’t necessarily work with hardware and hardware sometimes is perceived as a boys thing,” says Xing.

Christina Delimitrou, assistant professor of electrical and computer engineering and a member of the Computer Systems Laboratory, says the solution is to engage students as undergraduates and create positive experiences for them.

“I think the best way to increase the fraction of women and underrepresented minorities in general, is to get them to do research from earlier on. Engage them in research and then convince them to stay for graduate studies,” says Delimitrou, who has six women in her research group earning doctoral, master’s and bachelor’s degrees. “Essentially, it is a positive feedback loop. Once the new generation of students come in, they see many women in the graduate and undergraduate population, feel less isolated and engage in research themselves.”

Xing agrees that providing role models and mentorship is key to retention. “It’s not just faculty, but also with more women graduate students and fellow undergraduate students supporting each other, it leads to lot more open discussions,” says Xing.

### MOVING FORWARD

Recruiting women faculty to ECE is also a priority for the school. Currently, six of ECE’s 40 faculty members are women, five of whom were hired within the last three years. Future recruiting efforts will be conducted with Professor Alyssa Apsel in the director’s seat. Apsel is the school’s longest-tenured female faculty member and will become director in July 2018.

Xing says just as students can find strength and mentorship through faculty, professors can also find inspiration in their colleagues. That’s partly why she co-chairs Cornell Engineering’s Women in Science and Engineering group, which advocates for gender equality in a number of ways, including through faculty hiring.

“MY FEMALE STUDENTS ARE A BIT MORE RESERVED IN TERMS OF APPLYING FOR FELLOWSHIPS OR SUBMITTING A PAPER. THEY WANT TO GET THINGS MUCH MORE PERFECT THAN THEIR MALE COLLEAGUES, SO I HAVE TO PUSH THEM A LITTLE TO BE MORE PROACTIVE.”

— Christina Delimitrou
At a recent meeting of the group, Xing invited Cornell Engineering’s senior associate dean for diversity and faculty development to give a report on faculty hiring, including how many women were interviewed and how many received offers.

“We’re trying to push this kind of transparency, at least to educate ourselves, because when our groups are educated we can come up with better, more constructive feedback,” says Xing, who quipped that STEM faculty work best with facts and data.

Women in Science and Engineering is just one example of support groups available to women in ECE and other schools at Cornell Engineering. Others include the Society of Women Engineers and Women in Computing at Cornell. There are also travel funds designated for women graduate students and starting in 2018, a monthly “spotlight” will recognize an outstanding female student, postdoctoral researcher or faculty member in ECE.

“I think we’re doing well,” says Petersen of the effort to tackle gender issues in electrical and computer engineering. “We have more women than ever but there’s still some problems left and we need to address them to clear the path for the next generation of more diverse engineers.”

Assistant ECE Professors Kirstin Petersen, Christina Delimitrou and Mahsa Shoaran.
Over 1,100 students make up Cornell Engineering’s 29 student project teams this academic year. Students from the School of Electrical and Computer Engineering sit on 22 of those teams, competing regionally, nationally and internationally in engineering design and build competitions, or traveling the globe for service learning projects.
The School of Electrical and Computer Engineering is pleased to announce the five-year appointment of Professor Alyssa Apsel as the school’s next director, effective July 1, 2018.

Apsel, who previously served as director of graduate studies, has proposed many ideas to propel forward the already outstanding school. In particular, she is excited to continue the aggressive faculty hiring that has been underway for the past several years. She also views Cornell Tech as a great opportunity for the school, which now offers an ECE M.Eng. degree and has a number of new entrepreneurial programs available to faculty and students looking to commercialize their products.

Apsel will complete her sabbatical leave this spring semester in London. Clif Pollock, the Ilda and Charles Lee Professor of Engineering, will continue serving as director through the spring term.

“I’m delighted to pass the reins onto Alyssa,” said Pollock. “Her energetic leadership and vision will positively shape the future of ECE at both Cornell Tech and here in Ithaca. She has always been a steadfast contributor to our recruitment and programs, and she will be a great spark for our students. I look forward to a very positive and active next five years for the school.”

The ECE Director Search Committee was chaired by Dave Albonesi and committee members included Vikram Krishnamurthy, David Shmoys, Ed Suh and Huili (Grace) Xing.

Apsel is a professor of electrical and computer engineering and joined the faculty at Cornell University in 2002. She has won numerous research and teaching awards. Her research is focused on power-aware mixed signal circuits and solving the problems that arise in highly scaled complementary metal-oxide-semiconductors and modern electronic systems.
The human brain is a puzzle hidden in an enigma wrapped in a mystery. We can describe the basic parts that make up a brain but there is a vast distance between describing something and knowing how it works.

If we want to image the brain as it goes about its business in a living, breathing creature, we have limited options. One is the electroencephalograph. Another option is positron emission tomography. And a third choice is magnetic resonance imaging.

Each of these tools is useful for its own purposes, but none of them can see the activity of individual neurons inside the living brain with full clarity.

This is a vexing problem and one for which the National Science Foundation (NSF) is eager to find a solution. The NSF has found a willing partner at Cornell University in this quest to create technologies that will allow researchers to image the brain and the nervous system.

Cornell University has been awarded $9 million by the NSF to establish a neurotechnology hub whose mission is to create and develop new technologies for imaging neural activity in the brain and to share what they discover with the broader neuroscience world. The Cornell Neurotechnology Hub will be known as NeuroNex and the five co-principal investigators are Chris Xu (Applied and Engineering Physics), Joseph Fetcho (Neurobiology and Behavior), Mert Sabuncu (Electrical and Computer Engineering/Meinig School of Biomedical Engineering), and Nilay Yapici (Neurobiology and Behavior).

Each brings a unique bit of expertise to the endeavor, and together they hope to take three important steps.

1. Develop new imaging tools to look deep into previously inaccessible parts of the brain at scales that were previously not possible.
2. Use the tools to answer questions about how the nervous system generates behaviors.
3. Disseminate the tools through workshops, demonstrations and collaborations.

The NeuroNex team will start...
by adapting existing three-photon microscopes so they can be used on a variety of species. Three-photon microscopy has been employed effectively with mice to image neural activity in deep areas of the brain without causing damage to brain cells. Chris Xu and his collaborators will enable the same tool to be used with fruit flies, zebrafish and other species just as effectively.

Xu also hopes to design and build a new type of microscope that will combine with a novel form of illumination to create an imaging system that adapts to the sample being studied, with the goal of speeding up how quickly we follow neural activity. These imaging tools will be developed and utilized in a new space, the Laboratory for Innovative Neurotechnology at Cornell.

In addition to their reliance on foundational work started at Cornell by Professor Watt Webb years ago, these imaging tools share another characteristic: they will create enormous amounts of digital imaging data. And data, without the tools to make sense of it, is useless.

Of the five investigators, one is on the faculty of ECE. Mert Sabuncu officially started at Cornell Engineering in 2017 with a joint appointments in ECE and BME. As he was visiting campus prior to joining the faculty, Sabuncu came to see how extensive the neuroscience community was across the university.

“In conversations during my early visits at Cornell, I met a broad community of scientists studying the neural systems of diverse organisms that included fruit flies, zebrafish, mice and humans,” says Sabuncu. “I became excited about the large amounts of interesting and novel data these researchers are creating, as my research interests are in developing methods to handle, analyze and learn from such data.”

The challenges of dealing with massive amounts of data is exactly what Sabuncu has been working on in one form or another since his undergraduate years at the Middle East Technical University in Ankara, Turkey.

“Since I was a teenager, I knew that I wanted to be a scientist,” says Sabuncu. “I am a very curious person and an obsessive learner. As an undergraduate I had the chance to do research involving computer vision for radar data. This exposed me to the areas of image processing and computer vision and I was hooked.”

During his time in a postdoctoral research position at MIT and in a faculty position at Harvard’s A.A. Martinos Center for Biomedical Imaging, Sabuncu let his learning obsession run free and he took in everything he could find about a wide range of clinical research areas and genetics.

“I went to classes, I attended talks, I asked a million questions,” says Sabuncu. “The more I learned the more passionate I became about biomedical data and the things I could do with it.”

As a result of Sabuncu’s conversations during his early visits at Cornell, he was brought in to help create the NSF proposal for NeuroNex. “At Cornell, I’ll be developing novel algorithmic technologies for making sense of and exploiting large-scale biomedical data,” says Sabuncu. “NeuroNex is exciting to me because it will let me look at data from different animal models and at different scales. I am eager to inject our understanding of the imaging device and underlying biology into the data analysis tools we create.”

The imaging tools to be created at NeuroNex will be able to collect sophisticated data about the activity of many neurons over time along with information about the animal’s behavior at that time. Due to the complexity of the brain and the sheer number of neurons interacting in any given moment, using existing simple statistical analysis methods is likely to shed limited new light on the workings of the brain and nervous system.

“When you are looking at larger scales, you’re looking at thousands, potentially tens of thousands, of neurons activating simultaneously in complex patterns,” says Sabuncu. “You cannot get away with simple statistical analysis. You need to think about large-scale patterns that relate to the complex behavior these animals display.”

Sabuncu is thrilled to be part of this effort at Cornell. “I have always been drawn to the theoretical,” says Sabuncu. “And this is still true today. Yet, for me, mathematical abstractions are interesting in the way they relate to real world problems. I enjoy using my theoretical insights to devise practical solutions. Cornell gives me a great opportunity to do this with NeuroNex and within ECE, which is a world-class department that is a pioneer in marrying theoretical insights with real-world problems and has a unique focus on the interface between hardware and software.”
ECE junior Alicia Coto recently interviewed entrepreneur and alumnus Susie Kim Riley ’87 about her time at Cornell and her experience as a successful woman in business. Riley is founder and CEO of Aquto, a company focused on bringing the ecosystem of mobile operators, marketers and app publishers together through data sponsorship.

What did you most dislike?
Superlab! It was required by all juniors. They taught motors and power with big generators and motors in a huge, noisy lab. I was not interested in motors or winding, but the course was mandatory. I got my worst grade at Cornell—and got electrocuted in a lab! I think it hated me and I hated it.

Is there anything you wish you had done differently?
I wish I had taken advantage of more electives in the arts. I took German, art history, literature. I wanted to take things like painting and pottery but I just didn’t have the time. Between the social stuff and studies, there was very little extra time.

If you can, try to balance it out and take those interesting classes. They’re broadening and make you a more capable person after college. Life isn’t just about engineering.

Tell me about the trajectory of your career.
I graduated and married my college sweetheart and we stayed in Ithaca while he got his Ph.D. at Cornell. There were few engineering jobs in the area at that time, but I found one. Within months of joining, they lost a big contract with GE. They still needed to deliver on some projects, so they laid off everybody else except me because I was multifunctional and could do both hardware and software. After about a year, we got the contracts back. I learned a lot, but it was not a fun career experience.

Eventually my husband got his Ph.D. and we detoured through Minnesota for a year where I worked at another engineering company, but that was not a great experience either.

Finally, we went to Boston and I joined a company called Proteon whose protocols laid the foundation for the internet today. I found that one of the best ways to learn is to do all of your work and then go help other people finish their projects, so that’s what I did for almost five years.

I joined a startup developing new technology called asynchronous transfer mode that could move information around very quickly. I was their software/technical lead and threw myself at it. A couple years in, I got pregnant unexpectedly. But it was the best possible thing because I had my first child. It was difficult balancing everything. We went public first and then were acquired for $1 billion, which back in 2000 was a huge deal.

I then joined a friend’s company, and had my second child while I was there.
That company sold for $2.4 billion, but I take zero credit for that one.

After that, I started Camiant as the sole founder. More than six years later, I sold that to Tekelec for $130 million, and stayed on as the Chief Marketing Officer. Ultimately, Oracle bought Tekelec for $1.3 billion.

I became the entrepreneur-in-residence for the venture capital firm that funded my prior startups. After nine months of sitting on the bench, I decided to start another company called Aquto, and that’s where I’ve been for the last five and a half years.

For a current student starting out after graduation, would you suggest startups as the way to go?

There are so many startups now, you get to learn a lot and you get to wear lots of different hats. And the nice thing about startups today is that whatever you do actually matters. It will all go out the door, and you can put your fingerprint on it.

And for me I always took great pride in seeing my stuff deployed in the world. If you choose and want to go more into the business side, you have a great foundation to do that because you understand technology.

Any other words of wisdom for a current ECE student at Cornell?

Figure out what interests you and look for startups in that space. Dive into it. Do/learn as much as you can. Chart your own path. Too many times I hear these stories where people say, I want to have a certain quality of life so I’m just going to put in the hours. That’s just not the right attitude. If you want to have an impact, go out and throw yourself at it.

In your opinion, what does it take to be successful?

- Put yourself out there.
- Be willing to be accountable.
- Deliver.
- Don’t be fearful of work.
- Be confident but do it with humility. Don’t be cocky.
- Be capable and be helpful.
- Take the initiative.
- When you accomplish something, make noise but not too much. Don’t look like a try-hard, but showcase your ability.

If you can tackle work with this combination, with this approach, then people will start to recognize that and respect it.

How have you balanced life as a female engineer with a family and how did that affect your career?

Balance is a hard one. To me the hardest thing to be is an impactful professional, mother and wife. That combination is very hard to pull off. I think it’s gotten a lot better with this generation and I think it’s also dependent on your partner. Having a partner who is very supportive and helpful is key.

Some advice: never feel like you have to make a choice between career and family. Don’t be afraid to do both. But stay on the treadmill—it’s not easy, but it’s hard to get back on, so figure out how to stay on even if you have to do it part time.

What is the biggest challenge you’ve faced in leading so many companies?

I was the sole-founder and the boss of my second startup, but the investors said I was too young and didn’t have the experience to be a CEO. So I ran the company for a few years and then they hired a couple of CEOs, neither of which worked out. Today it’s a different ballgame. Now they let the founder be the CEO, but 15 years ago, that wasn’t the case.

You want to have a balance. You have to try to keep the energy of the young people, but try to pair them up with experience. I would have loved to have an advisor who could coach me to make sure I didn’t mess things up. I think investors today try to do that. Back then it was different. What really worked against me was age, rather than my gender. But today I don’t think that’s an issue anymore.

What are your current goals for the future and what are your plans to grow your career even further?

I would like to work with other startups and help them be successful. But when I’m doing something, I like to be 100 percent focused on what I’m doing, not thinking so much about what’s next because that’s a distraction from what you’re doing right now. If you start getting distracted with other stuff it can have a real impact on the core thing that you’re trying to make successful.

Any final advice?

Don’t give anyone a reason to use being a woman and a mother as an excuse. Find roles that keep you engaged and very productive while trying to take care of personal needs.

Your mindset is so important. Don’t start to think like a victim. It’s a downward spiral. Do the best job you can. Try to put the woman thing aside. As soon as you bring up the woman thing, it changes the dynamic.

E. Rose Agger ’17 M.S. won the Zellman Warhaft Commitment to Diversity Graduate Student Award at the 2017 Diversity Programs in Engineering Annual Awards Banquet recognizing outstanding undergraduate and graduate students, student organizations, faculty and staff.

Cecilia Chen ’18 won a National Science Foundation (NSF) Graduate Research Fellowship. The NSF Graduate Research Fellowship Program offers three years of stipend support during a five-year fellowship tenure to applicants selected through a national competition.

Yunye Gong, Ph.D. student, was awarded a Google Ph.D. Fellowship in Machine Learning. The fellowship recognizes outstanding graduate students doing exceptional work in computer science or related disciplines.

Firehiwot Gurara ’19 received an IEEE Power & Energy Society (PES) Scholarship Plus John W. Estey Outstanding Scholar Award for 2017. The award is distributed annually to the top PES scholar in each of the six IEEE U.S. regions.

Zygmunt Haas, professor emeritus, is co-author on a paper Google Scholar has recognized as a top 10 most cited paper since 2006. The paper, “Gossip-based ad hoc routing” is now considered a “classic paper” by Google Scholar.

Justin Kuo, Ph.D. student, received an Outstanding Student Paper Award for the paper titled “64-Pixel Solid State CMOS Compatible Ultrasonic Fingerprint Reader” at the IEEE International Conference on Micro Electro Mechanical Systems 2017 conference.

Nick Comly ’19 was awarded the 2017 Chen Outstanding ECE Undergraduate Teaching Assistant Award. Comly was a teaching assistant for ECE 2300, Digital Logic and Computer Organization, and his duties included grading homework, labs and tests and running one of the weekly lab sections.

Ibrahim Issa, Ph.D. student, and Ji Kim ’16 Ph.D., are co-winners of the 2017 ECE Outstanding Thesis Research Award. Issa introduces in his thesis a new information-theoretic and operationally defined measure that he calls “maximal leakage,” which can be subsequently used to study and design mechanisms to prevent information leakage for communication security. Kim proposes in his thesis a new approach that enables developers to begin with a standard task-parallel application for multicore processors, and then to automatically map this application to a novel loop-task accelerator platform.

The Cornell Chapter of IEEE-Eta Kappa Nu received an Outstanding Chapter Award from the organization, which serves as the honor society of IEEE. The chapter was selected based on its activities to improve professional development, raise instructional standards, encourage scholarship and creativity, and provide public service. The award was presented at the Annual Electrical and Computer Engineering Department Heads Association meeting.
Abhinandan Majumdar, Ph.D. student in the Computer Systems Lab, was awarded the 2017 ECE Outstanding Ph.D. Teaching Assistant Award. Majumdar was a head teaching assistant for ECE 2300, Digital Logic and Computer Organization.

Alyosha Molnar, associate professor, and several former students received the 2017 IEEE Sensors Journal Best Paper Award for their paper, “A Polar Symmetric CMOS Image Sensor for Rotation Invariant Measurement.” It will be presented during the IEEE SENSORS 2017 Conference Awards Presentation in Glasgow, Scotland.

Francesco Monticone, assistant professor, was awarded the Margarida Jacome Dissertation Prize by the Department of Electrical and Computer Engineering at UT Austin for his dissertation, “Scattering Engineering at the Extreme with Metamaterials, Metasurfaces, and Nanostructures.” He also won the 2017 Raj Mittra Travel Grant from the IEEE Antennas and Propagation Society, and was presented with it at the 2017 IEEE International Symposium on Antennas and Propagation/USNC-URSI National Radio Science Meeting.

Farhan Rana, associate professor, was elected the Joseph P. Ripley Professor of Engineering.

Christoph Studer, assistant professor, has received a CAREER Award from the National Science Foundation. The funding will be used for research related to hardware-accelerated Bayesian inference in order to bridge the ever-growing gap between theory and practice using a holistic approach that spans the circuit design, algorithm and theory levels.

G. Edward Suh, associate professor, received a Most Frequently Cited Paper Award (2000-2009) at the 2017 Symposium on VLSI Circuits in Kyoto, Japan. His paper, “A technique to build a secret key in integrated circuits for identification and authentication applications,” was originally presented during the 2004 Symposium on VLSI Circuits.

Lang Tong, professor, and former students received the Best Paper Award for Energy Systems at the 50th Hawaii International Conference on System Science for their paper “Probabilistic Forecasting and Simulation of Electricity Markets via Online Dictionary Learning.”

Aaron Wagner, associate professor, won the IEEE Information Theory Society’s 2017 James L. Massey Research & Teaching Award for Young Scholars. The award recognizes outstanding achievement in research and teaching. Wagner is known for his work on data compression and has made fundamental contributions to many other areas of information theory, notably the use of feedback in communication systems and the error analysis of channel codes.

Zhiru Zhang, assistant professor, received the Rising Professional Achievement Award from UCLA’s Henry Samueli School of Engineering and Applied Science. Presented to one alumnus annually, the award honors the early career achievements of alumni under the age of 40.

Christopher Batten, Peter Jessel and Farhan Rana received 2017 Excellence in Teaching Awards at Cornell Engineering’s annual Excellence in Teaching and Advising Awards Ceremony. The awards recognize faculty members for their commitment to mentoring and educating students.