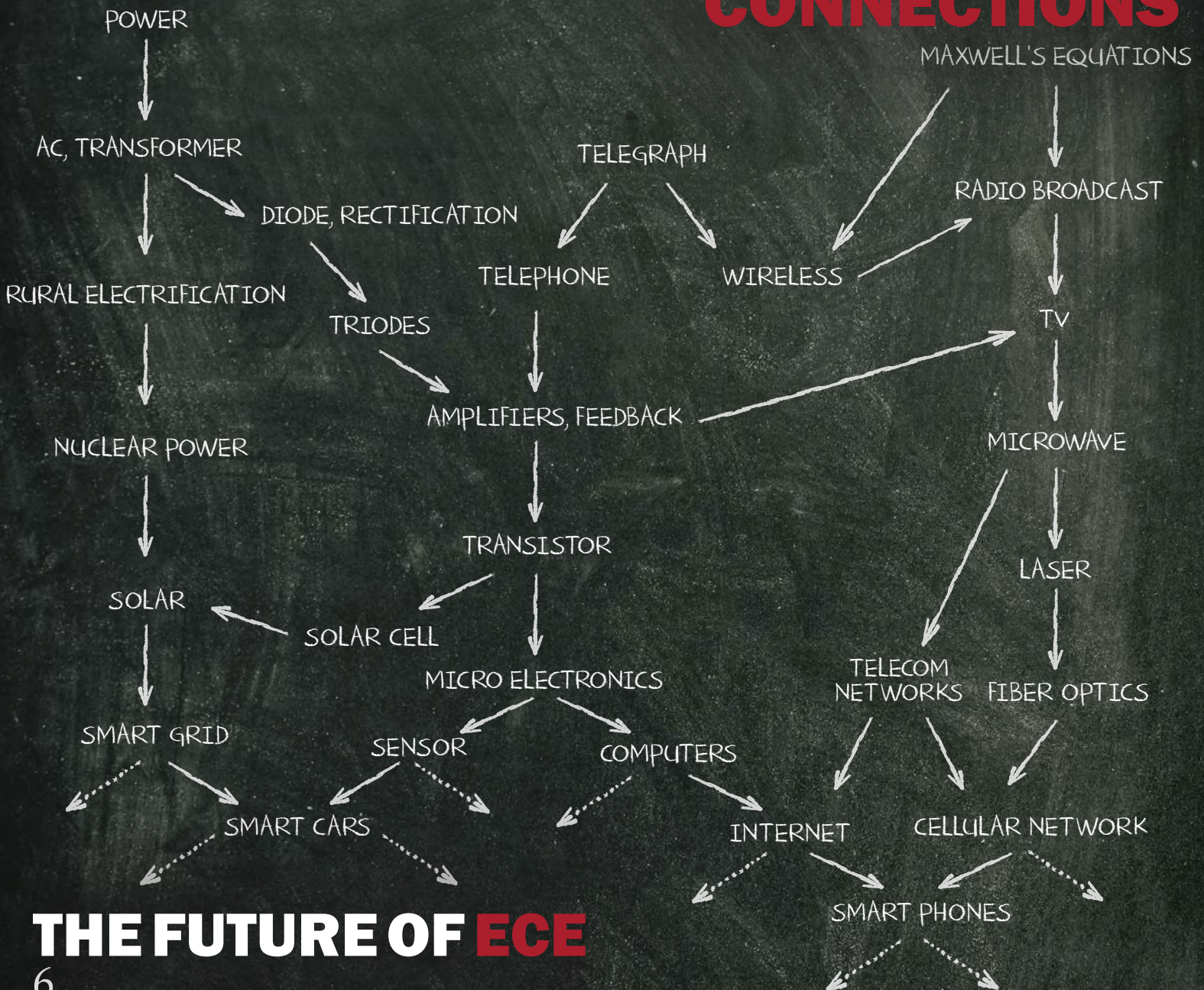




ECE

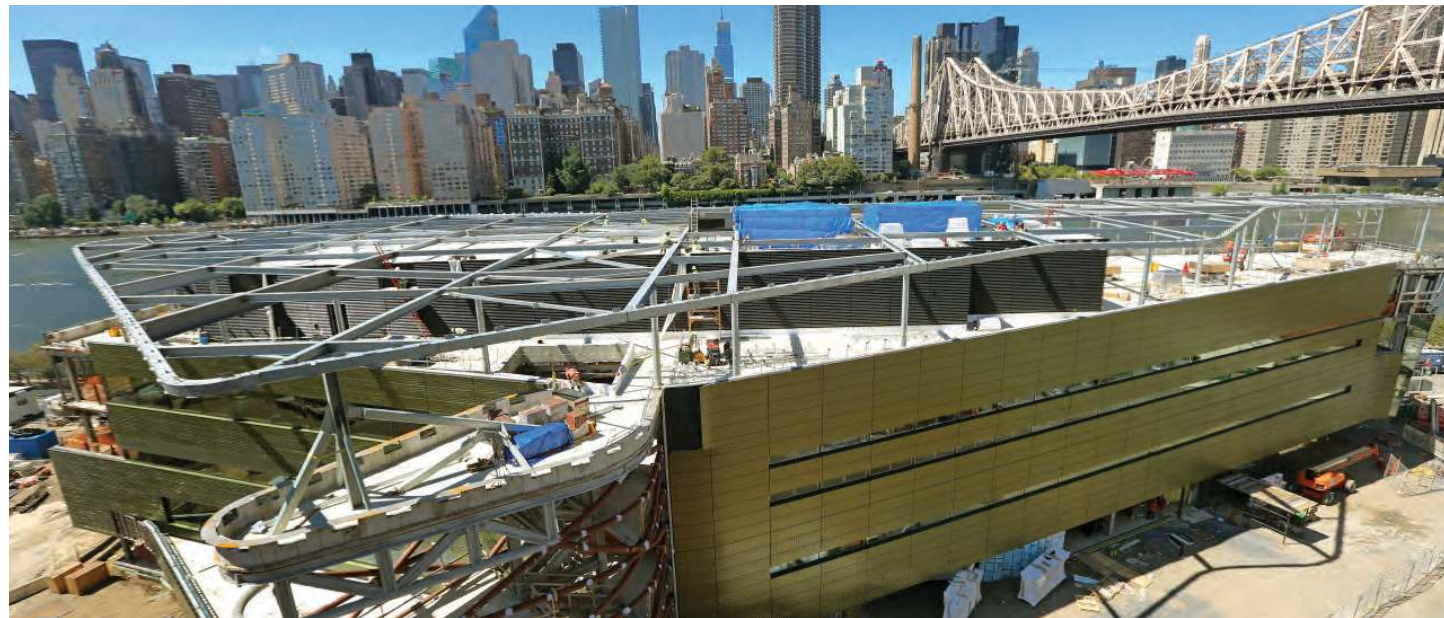
2016/2017

CONNECTIONS



THE FUTURE OF ECE

ECE GROWS WITH CORNELL TECH



Construction of Cornell Tech's Bloomberg Center, looking west toward Manhattan.

Big changes are afoot at the School of Electrical and Computer Engineering. As part of Cornell Tech, the university's recently-founded graduate tech campus in New York City, the department is entering a new era.

A small vanguard of faculty and students has already ventured to the city to join colleagues in computer and information sciences, operations research, law and business at Cornell Tech's temporary campus located on four floors of the Google building. They'll move to their much anticipated 12-acre Roosevelt Island campus when it is ready for use this summer. As Cornell Tech grows—when fully completed by 2037 it will serve some 2,500 full-time students and 200 full-time faculty—so will ECE, offering a chance for reinvention but also risk. ECE Director

and Ilda and Charles Lee Professor of Engineering Clif Pollock, for one, is excited. "It's a great opportunity for us that is finally starting to take shape," he said.

ECE has been an integral piece of the vision for Cornell Tech from the very beginning, says Pollock. In 2011, the partnership between Cornell and The Technion-Israel Institute of Technology won then-Mayor Michael Bloomberg's competition for a new campus within the Applied Sciences NYC initiative, charged with transforming the city's economy with new jobs.

"The ECE program is core to the Cornell Tech mission of developing pioneering leaders and technologies for the digital age," said Cornell Tech Dean Dan Huttenlocher. "This program fuses digital technology with practical product development experience and creative

thinking, teaching students how to use their technical skills to create valuable products and services."

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— Dan Huttenlocher

Cornell Tech ECE students will apply their expertise to address society's pressing needs, including better medicine, transportation and energy, says Pollock. Take smartphones that may soon be outfitted with numerous sensors, for example. One type might analyze its user's breath for disease-specific chemical signatures and send the results to a doctor.

"Those sensors don't come out of thin air," Pollock said. "That's what we do in ECE, work on how to build specific sensors, make them tiny and integrate them into a system. We are assembling a faculty of good people who'll work on the information science side of ECE and who can connect technology to some of these information issues."

This past year, two ECE professors arrived in New York, where currently 25 Cornell Tech tenure-track faculty teach 160 masters and doctoral students. After more than three decades in Ithaca, Rick Johnson, the Geoffrey S. M. Hedrick Senior Professor of Engineering, was invited to



View of construction on Cornell Tech's Roosevelt Island campus from the Queensboro Bridge.

Cornell Tech last spring for a three-year appointment as the Jacobs Fellow in Computational Arts and Humanities at the Jacobs Technion-Cornell Institute. He was joined this fall by new faculty member and Professor of Electrical and Computer Engineering Vikram Krishnamurthy.

For both professors, the campus's location in the big city is an essential part of its attraction. Johnson had already been making regular trips to New York

for years. Working in computational art history, he collaborates with New York institutions like the Metropolitan Museum of Art, the Morgan Library and Museum, and The Museum of Modern Art, as well as museums in the Netherlands. "So moving here was going to be a big boost to my research," he said. "Plus, my wife grew up in New Jersey and always wanted to live in Manhattan."

Johnson's recent work on matching



Rendering of Cornell Tech's campus, slated to open this fall on Roosevelt Island.

manufactured patterns in art may not fit conventional ideas about entrepreneurship, but it demonstrates the breadth of what Cornell Tech strives to be. For example, Johnson, an art history enthusiast as well as a distinguished electrical engineer, has transformed the painstaking process of manual thread counting in canvases by applying simple image processing techniques. “It turns out it can be handled with analysis that every electrical engineer learns when they’re a sophomore,” he said. This helps art historians to better date and authenticate paintings from the hands of masters like van Gogh or Vermeer by linking them to specific rolls of canvas.

“At first I wasn’t certain whether this kind of work is what Cornell Tech is looking for,” said Johnson, who is also a member of the graduate field of art history at Cornell. “But I’ve since learned that it expands beyond private companies to interactions with governments and non-profit organizations, producing something that impacts people outside of engineering.”

Krishnamurthy hopes to reach out to Wall Street for his research. “I’d like to collaborate with real quantitative analysts in NYC’s finance industry to develop sophisticated financial signal processing algorithms,” he said. He describes his other current interests as focusing on social network analysis using signal processing tools, as well as the use of feedback control in designing high performance reconfigurable sensing algorithms with applications in defense systems and biosensing.

Krishnamurthy will also serve as program director of a Master of Engineering (M.Eng) degree in Electrical and Computer Engineering at Cornell Tech. Launching in September 2017, it will

complement existing masters degrees in computer science and information science, as well as the broader palette of degrees offered by the Cornell Law School, the Johnson Graduate School of Management and The Technion.

Like the current Ithaca M.Eng, the new M.Eng at Cornell Tech will be a year-long program that focuses on state-of-the-art methods in signal processing,

“THIS PROGRAM FUSES DIGITAL TECHNOLOGY WITH PRACTICAL PRODUCT DEVELOPMENT EXPERIENCE AND CREATIVE THINKING, TEACHING STUDENTS HOW TO USE THEIR TECHNICAL SKILLS TO CREATE VALUABLE PRODUCTS AND SERVICES.”

— Dan Huttenlocher

data science and decision theory. The key difference, says Krishnamurthy, is that while the Ithaca M.Eng offers a more diverse program and a greater variety of projects, the Cornell Tech emphasis is on fusing technology with product

development, business and creative thinking. “It has exciting possibilities,” he said.

For its master’s degree projects, the New York-based M.Eng program will take advantage of the city’s network of businesses and other tech and innovation resources. Staff will vet interested companies that will identify problems and let multidisciplinary teams try their hand at solving them. And perhaps, Pollock hopes, these benefits will not stay limited to the city. Teams might be composed of members on both campuses, bringing in, say, circuit experts from Ithaca for support. “In some ways, we’re a microcosm of real-life conditions, in which companies have people in India and San Francisco, and teams have to work across international boundaries,” said Pollock.

As the M.Eng program grows, so will ECE’s Cornell Tech faculty contingent. Pollock expects that in 20 years, a third of ECE faculty will reside in New York, perhaps 20 to Ithaca’s 40. “It’s going to be a substantial portion,” he said.

Of course such a divide poses challenges. “We’ve been thinking about that a lot,” said Pollock, who has sought advice from other departments, such as entomology, which is split between Ithaca and the Agricultural Station in Geneva. The goal is to stitch together a unified entity. “Here or there, I’m in the same department,” said Johnson.

One idea is to move administrative interactions into the digital space. Departmental and committee meetings are linked by video, as are several courses. All but one participant in Krishnamurthy’s fall Ph.D.-level class (“Partially Observed Markov Decision Processes (POMDPs): Filtering to Controlled Sensing”) are in fact from the Ithaca campus. “So far it’s working out really well,” Krishnamurthy



Interior rendering of a completed building on the Cornell Tech campus.

reported. “The video conferencing facilities between Cornell Tech and Rhodes Hall in Ithaca are excellent at facilitating a highly interactive class.” He noted that masters-level courses will continue to be taught separately in the two campuses.

Face-to-face encounters, however, will continue to be crucial in building a departmental community that transcends the geographical division – and this is where many opportunities lie. “ECE in Ithaca and Cornell Tech are two complementary sides of the same excellent department,” Krishnamurthy said. Faculty and graduate students may spend semesters at the opposite campus or work on projects funded by joint grants that ensure significant research interaction between the sites. Even Ithaca undergraduates could work as interns in ECE projects at Cornell Tech. “I don’t think any other ECE school in the country has this opportunity to have one foot in a big city and the other foot in a quiet town,” said Pollock.

The same bonus applies to visitors, who could be invited to spend part of their time at each location—a move that may attract a greater variety of outside

scholars. “I think it’s going to be a much more stimulating environment,” Pollock predicted.

ECE’s faculty will also be more diverse, thanks to Cornell Tech. “We can hire people who are much more entrepreneurial and want to be in an entrepreneurial environment,” Pollock said. Among them is Krishnamurthy, who attributes some of this atmosphere to the open Cornell Tech spaces themselves. “One of the nice features of Cornell Tech is that colleagues in different areas, such as computer science and business, sit in

the same large office,” Krishnamurthy explained. “This results in interesting collaborative discussions.”

Ultimately, the ECE vanguard at Cornell Tech can apply that innovative spirit to shaping this part of the department, carrying it into the future. “This is a big theme here—to try and fashion a different style of engineering education that relies more on projects and teams and cross-disciplinary interaction,” said Johnson. “I’m a bit late in my career to be imagining that I’m going to be involved in a revolutionary form of education, but on the other hand, that’s one of the attractions here if you wanted to be on the frontlines of the new potential tide of engineering education.”

Pollock can’t wait to watch those waves roll in: “It’s going to be such a neat department,” he said. “It’s going to have such distinct strengths and things to offer. We’re going to be able to hire fantastic people, we’ll attract great students. We’re going to be a top school that impacts the whole world. That’s true for the whole college, not just ECE. It’s a tremendous opportunity. Give it a few years, get it started and it’s going to be an exciting time.”

—Olivia Hall



Northeast view of Cornell Tech’s Bloomberg Center, still under construction.