Cornell NYC Tech: Fall 2012 Academic Update

This is the first in what is envisioned to be a series of updates to the Cornell community about the academic plans and programs for Cornell NYC Tech. Our goal is to provide everyone at Cornell with the opportunity to gain a deeper understanding of the academic goals and plans for the new campus, through updates like this as well as through meetings with departments, schools and other groups within the university.

Cornell NYC Tech is creating a distinctive approach to graduate education and research in technology. It will foster the development of technologies that are rooted in the latest academic research and address real-world problems. The goal is to create a campus culture that blends academic excellence, commercial impact and societal benefits of technology. Students and faculty – in close collaboration with industry experts – will learn and work together and befitting New York City's role as the "capital of the world", Cornell NYC Tech has forged a partnership between Cornell University and the Technion Israeli Institute of Technology.

The new campus will attract the best and brightest in technology-related fields, immerse them in an entrepreneurial culture with deep ties to the local business community, and spur the creation of new companies and industries in New York City and beyond. Core academic and research efforts, both within and across disciplines, will generate sponsored research, collaborative research with companies, on-site corporate R&D offices, on- and off-site incubator and accelerator programs, and a broad array of projects that bring students, faculty, and companies together.

Fueling the Information-Age Economy

Since World War II, technology development has largely followed a "pipeline" or "funnel" model where research universities and a few government and corporate labs lead the way, with basic research results subsequently commercialized when companies develop products and services. Over the past few years this sequential model has not only accelerated but has also begun to break down, particularly in areas related to information technology. Instead, basic research questions are often pursued in parallel with product development, providing opportunities for commercial developments to drive fundamental research as well as vice versa.

Cornell NYC Tech is being designed with these changes in mind. The culture of the campus will bring together on an equal footing three key drivers: *academic excellence*, *interdisciplinary leadership*, and *entrepreneurial spirit*. Research and education at Cornell Tech will be undertaken with potential commercial and societal outcomes in mind from the outset. To simultaneously support both interdisciplinary research and deep grounding in core technology disciplines, the campus will be

organized in a matrix structure around interdisciplinary research areas that we term "hubs" as well as around more traditional computing and engineering disciplines. Initially three hubs are planned, in Connective Media, Healthier Life, and the Built Environment.

The hubs serve as focal points for the interdisciplinary research and educational mission of the campus, bringing together particular sets of disciplines that are most relevant to domains of particular commercial relevance in New York City. Thus all three initial hubs focus on areas where information technology is rapidly affecting large industry sectors in the city – the advertising, media and entertainment industries for the Connective Media hub, the health care and insurance industries for the Healthier Life hub, and the building, architecture and urban planning industries for the Built Environment hub. As technology and its relation to particular industry sectors changes, so will the interdisciplinary focal areas; thus the lifetime of hubs is expected to be from a few years to a decade or two.

Cornell NYC Tech will place significant emphasis on networking opportunities that involve industry leaders, successful entrepreneurs, and students—through guest speaker and industry mentor events, demonstration days, meet-ups, ties with early-stage investors and incubators, and more. These activities will draw people in the city's technology sector broadly.

Mandate and Scope of the Campus

Cornell NYC Tech is a graduate-level campus focused on the applied sciences and engineering, particularly those areas related to the information economy which plays such a central role in New York City. With a burgeoning tech sector, the City is increasingly home to local technology firms as well as R&D offices of national and global technology companies. Cornell NYC Tech is creating the academic environment to help power these companies, grow new companies, and develop whole new industries driven by technology and information.

While information and computing related disciplines are at the core of this mandate, many areas of academic inquiry are of critical importance, from business and economics, to law, to architecture and design, to medicine and public health, to the social and behavioral aspects of technology and culture. Thus there is also the opportunity for a broader range of disciplines to be part of the new campus, primarily as part of the interdisciplinary hubs but also sometimes as part of the discipline-specific educational and research programs. However, a number of technical disciplines do fall outside the scope of Cornell NYC Tech, including biotech, pharma, materials, and other "wet lab" disciplines.

The Interdisciplinary Hubs

Connective Media. The advance of handheld mobile devices, applications and software services is enabling interactions that profoundly change how people share experiences, from the ways we work and shop, to how we socialize and relax, to how we learn and inform ourselves. This transformation has

changed forever industries like advertising, media, entertainment and retail, which can mine information to look for shifts in public values and behavior and provide customized and targeted information. Analyzing the enormous flow of data (what has come to be referred to as Big Data) and extracting useful knowledge from it involves technical disciplines like computer science, information science and electrical and computer engineering, but it also requires an understanding of human behavior, needs, and desires. Cornell is particularly well positioned to bring together technology and the social sciences.

Healthier Life. Computing and information technologies offer opportunities to vastly improve our capacity to lead healthy and productive lives. For example, imagine having your entire health history at your fingertips – or more precisely your cell phone. Of course, this implies both reliability (authorized access on demand) and security (no unauthorized access). Networked devices can help manage complex pharmaceutical regimens and allow physicians to track the progress of their patients. Integrating sensors, networks and computers is fundamentally technology development, but making this useful to users requires an understanding of how data can be used to inform choices. Once again, the intersection of our digital and physical selves holds the greatest promise.

Built Environment. On average, Americans spend 90% of their lives indoors and expend over 50% of their energy resources on heating and air conditioning those environments (according to the EPA). Whether we, as a society, can achieve sustainable (and aesthetically pleasing) lives is heavily weighted by how well we manage our built environments, both indoor and outdoor. This challenge is especially demanding in an urban environment like New York City, where space of all kinds is at a premium, the public demands more than "functional boxes," masses of people must move around efficiently (transportation), and management of power demand is a critical aspect of sustainable energy solutions. In these domains, technology is evolving at a brisk pace, and it is critically important to make better use of the digital information provided by inexpensive, self-powered sensors that monitor buildings, networks that deliver that information and computers that add "intelligence" to all aspects of building and transportation operations.

Academic Programs

Cornell NYC Tech will emphasize hands-on "apprenticeship" style to complement classroom and assignment-based learning. Masters and PhD project work will involve close collaboration with mentors from industry in addition to faculty supervisors. Fridays will be reserved for experiential and practical learning.

Masters degree programs will mirror the matrix structure of discipline-based departments and inter-disciplinary hubs. One-year professional masters degrees are planned in disciplines core to the campus, and two-year Master of Science degrees corresponding to the hubs. The two-year MS degrees are to be offered jointly with the Technion, resulting in the award of both Cornell and Technion diplomas. All of these programs will be overseen by current graduate fields or professional schools, with the dual degree

programs subject both to oversight by the appropriate Technion academic bodies as well. Overall, eight masters programs are currently planned, rolling out over the next several years.

The one-year Cornell professional degrees that are approved for the Tech campus are the Master of Engineering (MEng) in Computer Science (CS), in Electrical and Computer Engineering (ECE), and in Operations Research and Information Engineering (ORIE), the Master of Professional Studies (MPS) in Information Science (IS), and the accelerated Master of Business Administration (MBA) which requires students to have an advanced degree in a technical field.

The one-year MEng and MPS programs that will be offered in NYC will have the same rigorous admissions standards and the same overall requirements of 30 credits as the existing programs in Ithaca, including a substantial project. The NYC campus curriculum, however, will require students to take 6 credits of required courses focused on entrepreneurial and business skills, in lieu of open electives. Students will also be required to complete a substantial 6 credit project, supervised by both a faculty advisor and an industry mentor; their projects will be connected with New York City companies, nonprofit organizations, or relevant industry-oriented activities.

Currently in the planning and approvals process, the dual degree MS with the Technion will combine depth in computing and engineering disciplines with breadth in one of the interdisciplinary hubs, including a substantive project that applies technical knowledge to a domain specific problem. The Connective Media hub program will be the first of the three hub programs to be offered.

All academic studies on the campus will reflect an entrepreneurial spirit, with a focus on collaborative projects, industry mentors, and entrepreneurship/business-related coursework. Doctoral students and postdoctoral fellows will pursue research under the supervision of graduate field faculty located on the Cornell NYC Tech campus. We envision, however, that doctoral education will involve first-year residence and coursework on the main campus in Ithaca for the foreseeable future. As the new campus grows, there will likely be some doctoral programs that are offered completely at the Cornell NYC Tech campus. While the campus will not offer undergraduate degrees, it is anticipated that over time there will be educational opportunities for Cornell undergraduates, ranging from short workshops to full-time study for a semester or a year.

Technion Partnership

The Technion-Cornell Innovation Institute (TCII), a 50-50 partnership between Cornell University and the Technion Israel Institute of Technology, plays a key role on the campus. TCII will be responsible for offering the two-year interdisciplinary hub-oriented dual degree MS program described above. TCII will also foster basic and applied research in the interdisciplinary hub areas jointly between the two institutions, led by TCII faculty (with tenure-track faculty having appointments in one of the two home institutions), PhD students, postdocs, and other researchers. TCII will have its own budget and will pay the full direct and indirect costs of its operations through tuition, research grants, and philanthropy.

The core of the TCII will be its tenure-track faculty, whose selection will be based on academic excellence and a demonstrated record of, and passion for, industrial engagement and entrepreneurship. Each TCII faculty member will be appointed at either the Technion or Cornell, with tenure and promotion decisions made by the individual institution. Tenure-track faculty at TCII will be balanced between Cornell and the Technion, with approximately half from each institution.

Faculty

The faculty of Cornell NYC Tech will be a mix of tenured and tenure-track professors, primarily in technical disciplines, who in addition to academic excellence have distinguished themselves in the development and use of technology in the commercial sector or for the betterment of society. Tenure-track Cornell faculty at Cornell NYC Tech will be hired in existing departments or schools, and their tenure home will rest with that department or school. Cornell NYC Tech will be responsible for the salary as well as the teaching and research responsibilities of these faculty positions, and the service responsibilities of the positions will be both to Cornell NYC Tech and to the home department or school. Initial hiring will focus on senior (tenured) faculty – junior faculty will be recruited once clear tenure expectations and appropriate mentoring are in place for the new campus.

The faculty teaching in any degree program at Cornell NYC Tech will be drawn primarily from the ranks of the graduate field(s) responsible for the degree, however in the interdisciplinary dual degree programs there will be teaching needs outside of the sponsoring fields for the programs. The teaching faculty will include Cornell NYC Tech faculty, adjunct faculty based in New York City, and faculty from the Ithaca campus. To ensure a high quality educational experience for students enrolled at Cornell NYC Tech, faculty will be expected to spend the majority of their time at the campus when teaching there.

Campus Facilities and Growth Plans

Cornell NYC Tech will grow at a rate commensurate with attracting the very best faculty and students. Initial programming will consist of short-courses and entrepreneurial workshops for students enrolled in appropriate programs at Cornell in Ithaca, with a small MEng class in Computer Science to begin in January, 2013. The full set of programs listed above will be reached in a few years. While construction of the initial campus on Roosevelt Island is occurring, Cornell NYC Tech will be located in temporary space in Chelsea provided by Google.

The first academic building on Roosevelt Island is planned to open for the 2017-18 academic year. Facilities in both the leased space and the permanent space will include desk space, research space, classrooms, and meeting, breakout and teaching spaces. The permanent campus facilities on Roosevelt Island will also include incubator space as well as corporate R&D space for companies to be co-located on the campus.

It is expected that each of the initial masters degree programs will have about 25-40 students per year, with an overall enrollment of around 300 masters students by the time that the campus opens on Roosevelt Island. At that point we also expect to have on hand approximately 40 faculty, and a

corresponding number of doctoral students, postdocs, and staff. Although the actual population may differ from these initial estimates, we expect the ratios of faculty to students to be in line with these estimates.

In the long term, the plans for the Cornell NYC Tech campus call for approximately 2,000 full-time graduate students and 300 faculty, as well as hundreds of researchers, entrepreneurs and other practitioners. By 2037 the campus is expected to comprise approximately 2 million square feet of space with a mix of uses including academic, corporate co-location and campus housing.

Planning and Governance

The academic programs on the tech campus are being overseen by Dean and Vice Provost Dan Huttenlocher, while the administrative aspects are the responsibility of Vice President Cathy Dove. Together, they are working with appropriate faculty and administrative colleagues in Ithaca and New York City to hire faculty and staff, and to plan and then operate the new facilities on Roosevelt Island. A key goal is to ensure that Cornell NYC Tech is an integral part of Cornell as a whole, and is well integrated with the Ithaca and Weill Cornell campuses in particular. Several interlinked planning efforts will support the development of a culture at Cornell NYC Tech that is focused on the fast-paced world of technology innovation and commercialization, while at the same time retaining the academic excellence and identity of Cornell more broadly.

An executive committee, co-chaired by Lance Collins and Dan Huttenlocher, with members Soumitra Dutta, Kent Fuchs, Laurie Glimcher, Kent Kleinman, Barb Knuth, Alan Mathios, John Siliciano, Eva Tardos and Cathy Dove (ex officio), is responsible for providing guidance on the relation between the Ithaca campus and the Cornell NYC Tech campus (including issues such as the structure of academic programs and administration, resources in support of integration between the campuses, and relationships between programs on the campuses). An Academic Planning Committee co-chaired by Rajit Manohar and David Shmoys, with members Claire Cardie, Chris Ober, Rainu Kaushal, Kevin Pratt, Wes Sine, and Gun Sirer, has been actively working on the degree programs and faculty recruitment. There have also been substantive activities in the departments, schools and graduate fields that are involved in planning the initial degree programs described above (Computer Science, Electrical and Computer Engineering, Information Science, the Johnson School and Operations Research and Information Engineering), as well as engagement by the General Committee of the Graduate School in the review of planned degrees. The Committee on Academic Programs and Policies (CAPP) of the Faculty Senate has been involved since the proposal process, reviewing and making recommendations regarding academic structures and procedures for the campus. Finally, a number of departments and schools are discussing how they may engage in activities in Ithaca or at other locations in New York City that complement the programs currently planned for Cornell NYC Tech.

Impact on the University

The Cornell NYC Tech campus has created a buzz for Cornell. The grant of a dozen acres and $100 million from the City of New York, has burnished Cornell's stature as the "land grant" University for the State of New York, if not the world. The string of exciting developments that have followed, including: Google providing space for the campus for five years, the hiring of distinguished faculty and staff, and the appointment of a steering committee composed of Michael Bloomberg, Irwin Jacobs and Eric Schmidt, has enhanced the visibility of Cornell more broadly as well.

The long-term reputational impact of the tech campus may well be much greater, more important, and more enduring. The location of R&D offices in NYC of giants like Google, Facebook and Microsoft testifies to the tremendous growth of tech in the City. The fact that Cornell has been asked to provide leadership in this area is an incredible opportunity, a modern form of "public engagement." Indeed, improved engagement with companies in the tech sector has been a goal of a number of departments and schools at Cornell for a number of years, substantially predating the competition that led to the establishment of Cornell NYC Tech.

The selection of Cornell has already paid dividends to the schools and colleges at Cornell with closest ties to Cornell NYC Tech, and to the University more broadly. For example, the previously stable acceptance rate for admitted undergraduates in the College of Engineering jumped this year. A second example is the first ever Startup Career Fair that was held last February. Over 40 companies (35 from NYC) visited and over 5,000 students from across the Cornell campus participated. The excitement was palpable, and we are planning for an even larger event for next year.

Another important benefit of the enhanced visibility of the NYC Tech campus is in philanthropy. For instance, this year the College of Engineering saw a greater than 50% increase in gifts and commitments as compared with last year. Moreover, the number and size of major gifts that have the largest impact on Cornell are on the rise; to date Cornell NYC Tech appears to have had a positive effect on philanthropy, with some heretofore inactive alumni stepping up their giving to the Ithaca campus – and, along with the president, provost, and colleagues in Alumni Affairs and Development, we are determined to keep it that way (in part, by soliciting gifts for Cornell NYC Tech from non-Cornellians).

Two universities, Stanford and MIT, have leveraged their technology prowess to enhance their overall institutional reputations. Both are routinely ranked among the top ten universities in the US if not the world. Technology development and commercial activity, it seems clear, can help raise a university's academic ranking overall. People often focus on the potential for huge financial reward of the most successful enterprises – Apple, Google and Amazon - without realizing the broader role technology can play. It is in this context of showcasing the incredible talent of our faculty and students that Cornellians feel such an excitement about Cornell NYC Tech. And the Tech campus can also help focus research (in New York and in Ithaca) on the most important knowledge gaps, those that have the greatest potential for societal benefit. At its best, this two-way flow of ideas outward and challenges inward will provide a dynamic that feeds and enriches scholarship, teaching, and public engagement on all Cornell campuses.