Cornell University

THE NYC TECH CAMPUS

Driving Innovation and Entrepreneurship
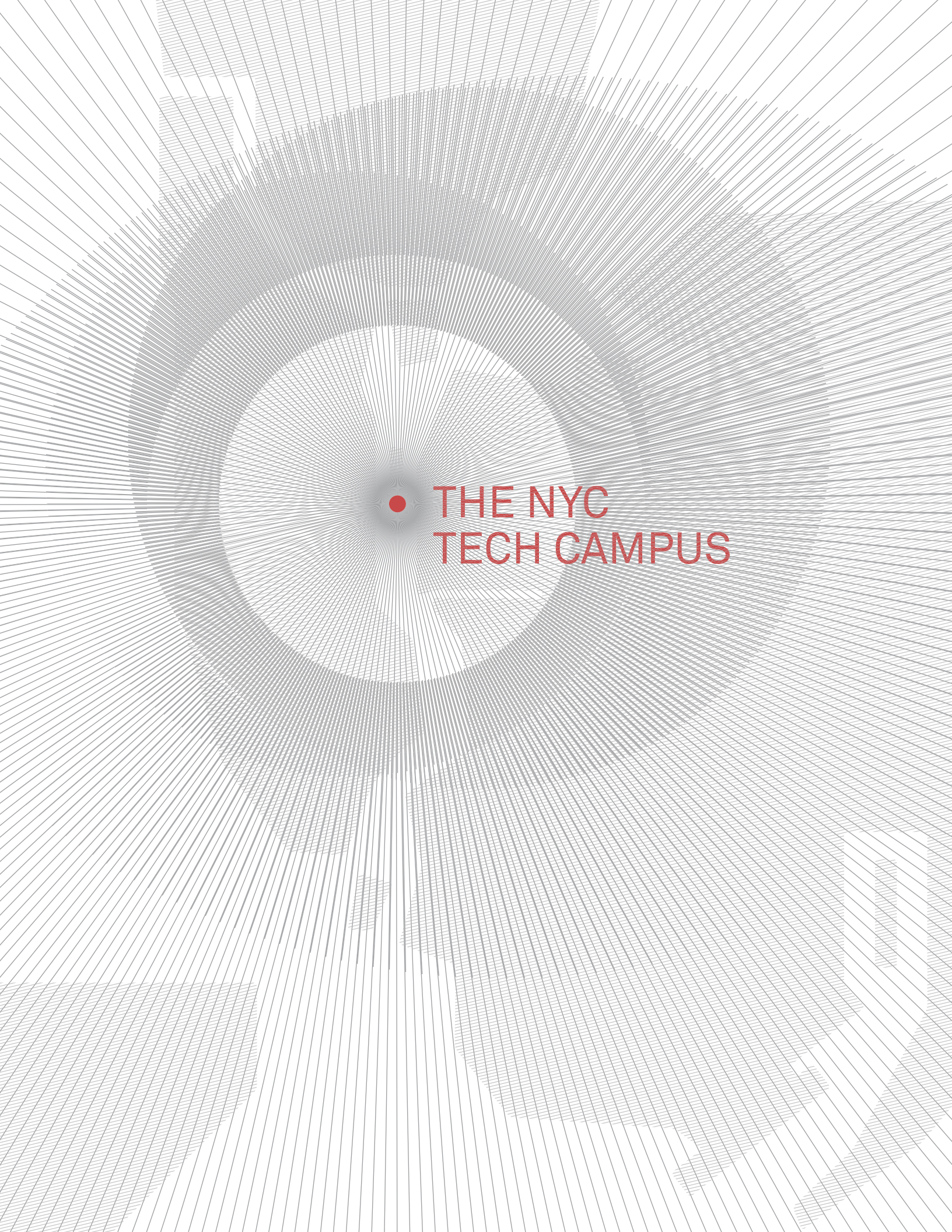
Technion
Israel Institute
of Technology

A POWERFUL PARTNERSHIP:

NEW YORK CITY WITH CORNELL AND THE TECHNION

THE NYC
TECH CAMPUS

The Opportunity

New York City, the world's leading commercial center, is uniquely positioned to capitalize on a seismic shift underway as the global technology sector moves from a focus on technology development towards value creation through the use of technology to transform industries. The technology sector in New York City has long been distinguished by such an emphasis, from financial technologies in the 1980's and internet advertising in the 1990's, to the social media and online retail companies of today.

New York's distinctive combination of expertise in both commerce and technology presents the city with the opportunity to capitalize on this emerging shift in the sector to become the world's leading technology city.

This tremendous potential for growth, however, is hampered by a lack of technical talent with the depth of skills generally found at the top engineering and computer science schools and, equally important, the practical knowledge of how to apply those skills in other domains. Mayor Michael R. Bloomberg has presented a dramatic challenge to the academic community that sets the stage for New York City to confront this need in a bold fashion. Cornell University and the Technion have embraced this challenge and are prepared to create the world's leading campus dedicated to technology and enterprise – a campus that will attract the best and brightest in technology, immerse them in an entrepreneurial culture with deep ties to the local business community, and spur the creation of new companies and new industries in New York City.

A New Academic Model

Cornell will develop the full-scale NYC Tech Campus, and in partnership with the Technion create the Technion-Cornell Innovation Institute (TCII) a bold, new academic model where education and research are focused on creating and growing companies and industries. The campus will be organized around interdisciplinary "hubs" designed from the ground up to put technology and enterprise on an equal footing and to engage the

multiple disciplines that are essential to connect cutting edge education and research to real world impact.

The hubs draw on the core technical disciplines of computer science, electrical engineering, information science, and operations research, but also on a broad range of other disciplines such as business, communication, design, economics, and public health that are critical to technology-driven innovation. The focus of the hubs will be dynamic, evolving to keep abreast of trends in both technology and markets. Initially, three hubs will address the key sectors of media, healthcare and the built environment.

The NYC Tech Campus, located on the Goldwater Hospital site on Roosevelt Island, will house over 250 full time dedicated faculty, with nearly 2,000 graduate students pursuing a range of masters and doctoral degrees from Cornell and the Technion, including a novel new dual Masters of Applied Science (MASc). These educational programs will produce students possessing both deep technical skills and substantial knowledge of and

engagement with the commercial potential of technology. The NYC Tech Campus will also serve as a pipeline to draw students at all levels from Cornell's Ithaca campus to New York City, and provide access to Cornell's existing specialized facilities and expertise across a wide array of engineering and applied sciences disciplines.

Entrepreneurship and Innovation

Building on the fundamental core strengths of the two institutions, the unique new programs of the NYC Tech Campus will foster a rich entrepreneurial and commercial culture, producing talent with the knowledge, skills, courage and passion to carry their ideas to fruition. The NYC Tech Campus' core academic and research activities will generate and attract substantial commercial and entrepreneurial activity, including sponsored research, collaborative research agreements with companies, corporate co-tenancies, on- and off-site incubator and accelerator programs, student internships

and company projects. With demo days, meet-ups, industry mentors, and ties with early stage investors and incubators, the campus will be a focal point for the city's technology sector.

Cornell's base of approximately 50,000 alumni who live and work in New York City will play a critical role in connecting the campus to the business community, making the city the ideal place for graduates to start their companies and pursue their careers. Already nearly 2,500 alumni have expressed an interest in mentoring student projects and making angel investments in companies started by students and faculty on this new campus.

In the past five years alone, Cornell alumni have created over 2,600 companies—employing over 34,000 people, and raising over $10.6 billion in new capital. It is anticipated that the economic impact of the NYC Tech Campus will match or exceed this rate, with its unique focus on technology innovation and entrepreneurship in partnership with the Technion.

A Public Resource

The NYC Tech Campus will define the urban campus of the future, with the aspirations and obligations to be a local and global citizen integrated from the start. Consistent with the spirit of innovation it embodies, the campus will be home to New York City's largest net-zero energy building. With its approximately eleven acres of interconnected public spaces and green roofs, public programming, employment opportunities, and Cornell's traditional emphasis on community service, the campus will be a resource for its neighbors on Roosevelt Island, in neighboring Manhattan and western Queens, and for the city as a whole.

Committed to improving the pipeline of college ready high school graduates entering the applied sciences, the NYC Tech Campus will support K-12 education in the STEM subjects through teacher training, engagement with existing schools on Roosevelt Island and the creation of a new high-tech high school in partnership with the New York City Department of Education.

The Team

Cornell University and the new Technion-Cornell Innovation Institute (TCII) are the ideal academic partnership to make New York City's tech sector the dominant global force in technology. Cornell and the Technion are global leaders in engineering and the applied sciences, with the academic star power to bring the world's best technology students and faculty to New York City. Cornell's uniquely interdisciplinary approach to technology, with its cross-departmental graduate fields and its cross-college Faculty of Computing and Information Science, particularly matches New York City's longstanding focus on using technology to transform commerce.

Cornell and the Technion share deeply entrepreneurial cultures, with the economic impact of Cornell's alumni from coast to coast among the highest in the nation, and the Technion's alumni playing a legendary role in transforming Israel into a global technology leader. The Technion further brings a level of expertise in technology transfer to existing industry that is unmatched in the world, with research and development centers from almost every leading global technology company located near the campus in Haifa. Nationally and globally, alumni of Cornell and the Technion are senior leaders at many of the world's leading technology companies and many of the most recognized venture capitalists.

Cornell has deep ties to New York City and extensive experience operating multiple campuses in an integrated fashion. Nearly half of the $3.4 billion Cornell has raised since 2006 came from New York area donors, and Cornell currently employs over 5,000 people in New York City. Weill Cornell Medical Center (WCMC), on Manhattan's Upper East Side, recently commenced its latest expansion with the construction of a $637 million state of the art medical research facility.

Through its long standing operation of WCMC, as well as a second medical campus in Doha, Qatar since 2001, Cornell has developed the expertise necessary to maximize collaboration across campuses. This unrivalled experience, as well as the proximity to and integration with the Ithaca and WCMC campuses will radically accelerate the launch of the NYC Tech Campus and amplify its long term impact.

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DRIVING INNOVATION AND ENTREPRENEURSHIP

Micah Rosenbloom '98

is an investor and serial entrepreneur who lives on Manhattan's Upper West Side. As a founding partner of one of New York's most active seed funds, Founder Collective, he has backed three dozen ventures in the city alone. Rosenbloom is also the CEO of Novophage, which capitalizes on advances in synthetic biology to provide safe alternatives to toxic industrial chemicals. His previous startup, Brontes Technologies, developed the first handheld scanner for dentists, eliminating the need for plaster impressions. It was acquired by 3M in 2010.

1. Respondent Information

Intellectually Stellar, Proudly Practical

Cornell is one of the world's great research universities, renowned for its achievements across a wide range of disciplines, notably including computer science and engineering. True to its founding mandate to serve the community and state, Cornell combines academic excellence with a proud, proactive interest in the commercially useful application of scientific knowledge.

History and Core Strengths

Cornell was established in 1865 by one of America's great 19th-century entrepreneurs, a co-founder of Western Union. Unlike some of his fellow philanthropists, Ezra Cornell wasn't trying to distance himself from his commercial past. He created Cornell as an institution that would put practical subjects on an equal footing with the traditional classics curriculum, and leave a legacy of economic improvement to his region, his state, and the world.

Engineering and applied science thus have a long and illustrious history at Cornell. The engineering school opened its doors in 1870. In 1883, Cornell offered the world's first course of study in electrical engineering. It was America's first university to award doctorates in both electrical and industrial engineering.

Today, Cornell encompasses 14 schools with 20,000 undergraduate and graduate students. As the only Ivy League university that is both privately endowed and a land-grant institution of its state, the university carries on its founding tradition of academic leadership, public service and economic development in many fields, notably in the disciplines that underpin the information economy—Computer Science, Electrical and Computer Engineering, Information Science, Operations Research and Information Engineering.

Unlike most peer institutions, Cornell organizes its graduate programs around cross-departmental fields of study - an approach that promotes interdisciplinary work as well as collaboration. This unusual culture has made the university especially hospitable to the development of research centers and institutes, which provide a means for faculty and staff to share specialized facilities and equipment, and to self-assemble into powerful teams with the breadth and depth to attack some of the most complex (and inherently interdisciplinary) research problems of our time.

Partly as a result, Cornell has a rich and well-established culture of entrepreneurship among both faculty and students. Its alumni, who include the founders and leaders of a remarkable number of well-known tech companies, understand what it takes to build successful and sustaining technology businesses.

Top Grades Across the Board

As a major center of science and research, Cornell is regularly among the top five universities in the United States in funding from the National Science Foundation, and was ranked number one in fiscal year 2008. In 2009, Cornell spent over $687 million on science and engineering research and development. According to *US News & World Report*, Cornell currently ranks fourth in the number of its graduates who go on to pursue PhDs in engineering or the natural sciences.

Cornell faculty members have earned recognition in every major category of award and distinction in the world, from Nobel Prize winners to election to every prestigious national academy. Cornell faculty members have won Pulitzer Prizes, MacArthur Foundation "genius" awards, Guggenheim fellowships, Russell Sage fellowships, National Endowment for the Humanities fellowships, Howard Hughes awards, the Crawford Prize, the Turing Award, the Fields Medal, Fulbright Fellowships, and others too numerous to list here.

Current Campuses

In addition to Cornell's main campus in Ithaca, New York, the University has medical campuses in New York City and in Doha, Qatar. Cornell has deep experience developing and managing multiple campuses.

Cornell's Ithaca campus is situated on over 745 acres, where 11 undergraduate, graduate, and professional schools offer more than 4,000 courses. Cornell students, faculty, and staff comprise approximately one-third the population of Tompkins County, and provide valuable economic and cultural support to the surrounding area. The Ithaca campus is a unique and seamless intersection of public and private education; of nature and the built environment; of tradition and cutting-edge technology and research.

Cornell's Joan and Sanford I. Weill Medical College and Weill Cornell Graduate School of Medical Sciences are located on the Upper East Side of Manhattan between 65th and 72nd Streets. Working closely with the affiliated organizations Sloane-Kettering, the Rockefeller University, the Hospital for Special Surgery and New York Presbyterian Hospital, Cornell has helped develop the area into a bio-medical corridor of internationally renowned treatment and research. With the upcoming addition of a $1 billion new facility which will double the school's research space, Weill Cornell is a huge resource and player in New York's medical research community.

Weill Cornell Medical College-Qatar has grown rapidly since its opening in 2002 in Education City, just outside the capital Doha. It is the first medical school in Qatar, and the first American medical school to award a degree outside the United States. It awards the same degree as Weill Cornell in New York, and its faculty hold the same appointments.

Governance and Management Structure

Cornell is governed by a 64-member Board of Trustees with "supreme control over the University, including every college, school, and academic department, division, and center…" The Board of Trustees elects the president, who is the chief executive officer of the University. The provost serves as the chief educational officer responsible for all academic programs, and as the chief operating officer responsible for providing general supervision to all segments of the university.

Additionally, the Provost for Medical Affairs based in New York City reports to the President of Cornell University and to the Board of Overseers of the Weill Cornell Medical College and Weill Cornell Graduate School of Medical Science. The 70-member Board of Overseers is responsible for general supervision of programs and operations of the medical college and graduate school.

Faculty and Staff

Cornell's outstanding reputation rests upon that of its faculty, a community of innovative men and women who embody and promote excellence in teaching, research, outreach, and service.

Forty-one Nobel laureates are affiliated with Cornell. In 2010-11 alone, eight Cornell faculty members were elected to membership in the

Colleges and Units of Cornell University

College of Agriculture and Life Sciences

College of Architecture, Art, and Planning

College of Arts and Sciences

College of Engineering

School of Hotel Administration

College of Human Ecology

School of Industrial and Labor Relations

The Faculty of Computing and Information Science

Graduate School

Cornell Law School

S.C. Johnson Graduate School of Management

Weill Cornell Medical College

Weill Cornell Graduate School of Medical Sciences

College of Veterinary Medicine

School of Continuing Education and Summer Sessions

1865 Cornell University founded in Ithaca, NY

1898 Weill Cornell Graduate School of Medical Sciences, New York, NY

1952 Weill Cornell Medical College, New York, NY

2001 Weill Cornell Medical College, Doha, Qatar

National Academies of Sciences and Engineering, the Institute of Medicine, and the American Academy of Arts and Sciences. Their national peers, in choosing them, honored contributions that range from the design of trustworthy and secure computer systems to mathematics and medical ethics.

Many of the University's engineering and computing and information science faculty are among the top in the world. Among these faculty members are 30 members of the National Academy of Engineering, two members of the National Academy of Sciences, two A.M. Turing Award winners, and many other leading professionals in their fields.

As a major economic engine of New York with a workforce of 13,000 people, Cornell is dedicated to recruiting and retaining outstanding faculty and staff. Currently Cornell employs over 2,700 faculty and over 10,000 staff on the New York State campuses.

The University weathered the recent economic downturn that forced retrenchment in higher education institutions across the United States. The overall size of the Ithaca staff has declined by approximately 5% in the last five years. However, due to strategic measures to protect much of the workforce and pursue cost-saving opportunities and management strategies to improve efficiency at the University, Cornell emerged stronger and is now well positioned for continued excellence.

The size of the faculty has remained fairly stable over the past decade. On the Ithaca campus, there was a gradual increase from 2000 to 2009. This was followed by a brief decline after the onset of the recession, but the numbers quickly rebounded. In 2010–11, the Ithaca campus alone hired 88 oustanding new tenure and tenure-track faculty members.

Cornell's ongoing commitment to its personnel is displayed in the 2010–2015 Strategic Plan, which highlights faculty and staff excellence as priorities.

Specific goals that support faculty excellence are: increase the size and quality of faculty in strategically important academic areas; significantly increase the diversity of faculty through new hires and enhanced retention efforts; ensure competitive faculty compensation; develop and implement policies to retain highly valued faculty; devise and implement new mechanisms or policies for rewarding outstanding faculty and for continually assessing faculty performance as scholars and teachers; foster an exciting intellectual environment by providing opportunities for more dialogue and engagement; and develop ways to enable faculty to focus their time on being highly productive in their core academic activities (research, scholarship, and creativity; teaching; public engagement).

To bolster staff excellence, the university is focusing its energy to: give priority to retention of highly qualified staff in valued positions as the university reorganizes to address budgetary constraints; attract a talented and diverse workforce to Cornell; be an exemplary employer across the entire spectrum of staff; provide job skill training to staff in a variety of venues; sustain and, wherever possible, enhance flexibility in the workplace and workforce; and work with the local community to keep Ithaca and Tompkins County vibrant places to live and work.

Students

Cornell, one of the largest Ivy League institutions, enrolls over 20,000 students from a wide range of cultural and socioeconomic backgrounds.

Fall 2011 Enrollment

Undergraduate	14,167
Graduate/ Professional	
Ithaca	6,964
Total medical graduate/ professional (NYC and Qatar)	1,144
Total University	22,275

Includes all on and off campus registrants

Undergraduate

Cornell students hail from all 50 states, plus Washington, D.C., Puerto Rico, and 124 countries worldwide.

The class of 2015 was selected from among 36,387 applicants for freshman admission—an all-time high and the largest pool in the Ivy League. In Engineering, applicants approached 10,000, with a highly selective acceptance rate of 19%. One fifth of University applicants self-identify as underrepresented minorities. Cornell currently ranks 10th in economic diversity, according to *US News & World Report*, with about one-tenth of its students coming from abroad.

The admissions process at Cornell is decentralized; that is, prospective undergraduates apply directly to the college or school of their choice within the university. They also have the option to apply to another one as an alternate. Each college and school has different application requirements (provided electronically).

Consistent with Cornell's founding mission to serve "any person, … in any study," the university is fully committed to admitting and supporting a diverse student body.

While admission to Cornell is highly competitive, the University vigorously supports equality of opportunity. Building on a long tradition of access and opportunity for students without regard to personal background and circum-

stances, Cornell is one of a select number of institutions practicing need-blind admission for undergraduate students. Cornell has committed itself to bolstering its aid programs, even during the recent economic downturn.

The economic diversity of Cornell's students is evidenced in the total number of Pell grants, which are awarded to low income students. In 2010–2011, Cornell had the highest number of Pell Grant recipients enrolled at the University in five years, while providing financial support to 49% of undergraduate students with an average financial aid package of $37,425. It is also interesting to note that fully 20% of Cornell's transfer students entered with two year degrees, largely from community colleges.

% Enrollment Receiving Pell Grants

Year	% Fall Enrollment
2006-2007	14%
2007-2008	14%
2008-2009	13%
2009-2010	16%
2010-2011	18%

Undergraduate Numbers

U.S. Enrollment by Region –Undergraduate

Fall 2011

Social & Behavioral Sciences, Law 17%
Engineering & Computer Science 21%
Biological Sciences 12%
Business 14%
Agriculture & Natural Resources 15%
Fine & Applied Arts 7%
Physical Sciences & Math 3%
Language & Humanities 11%
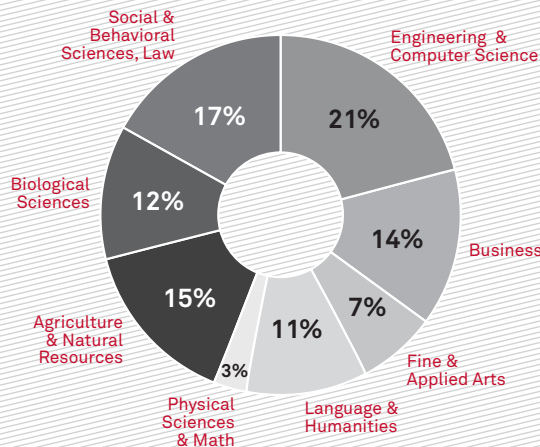
Need–Based Grant Recipients by Income–Undergraduate

2010–2011. Out of 6,840 students receiving need-based grant aid from Cornell

$120,000+ 26%
$0–$74,000 46%
$75,000–$119,000 28%
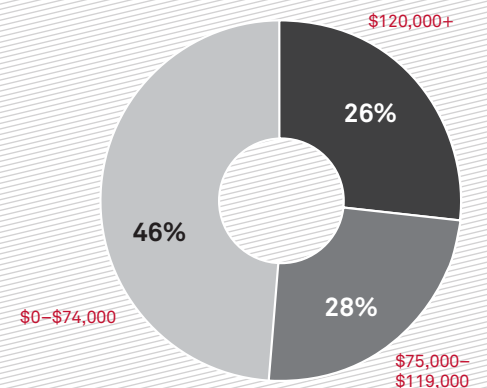
Graduate

For graduate studies, the graduate faculty of the relevant field recommends admission based on the applicant's aptitude for graduate work in that field and the availability of faculty and facilities for the applicant's proposed research. To matriculate in the Graduate School, an applicant must have received a baccalaureate degree or its equivalent from a college or university of recognized standing.

The Graduate School supports a majority of its graduate students through fellowships, assistantships, or grants. Its competitive funding package includes tuition, fees, health insurance, and a living allowance or stipend for a significant number of students in research PhD programs.

Each year, Cornell's top-notch graduate students receive National Science Foundation, Javits, Fulbright, and other prestigious national awards in addition to a significant number of research training grants and national research grants administered by individual faculty.

Professional programs at Cornell provide limited financial assistance, with terms of awards that vary according to the program.

Fall 2010 Graduate Student Financial Support

	Number	Percent
Doctoral Students	2,949	100%
TA & GA	1,024	35%
RA & GRA	1,080	37%
Cornell Fellowships	573	19%
Other Fellowships	155	5%
Self/Unknown	117	4%

	Number	Percent
M.A./M.S. Students	217	100%
TA & GA	45	21%
RA & GRA	49	23%
Cornell Fellowships	20	9%
Other Fellowships	3	1%
Self/Unknown	100	46%

	Number	Percent
Professional Master's Students	1,686	100%
TA & GA	96	6%
RA & GRA	23	1.5%
Cornell Fellowships	74	4%
Other Fellowships	8	0.5%
Self/Unknown	1,485	88%

Post-Baccalureate Degree Disciplinary Grouping

Post-baccalureate degrees awarded in the 2010–2011 academic year

Business 26%
Fine & Applied Arts 5%
Language & Humanities 6%
Physical Sciences & Mathematics 9%
Agriculture & Natural Resources 6%
Biological Sciences 5%
Social & Behavioral Sciences, Law 12%
32%
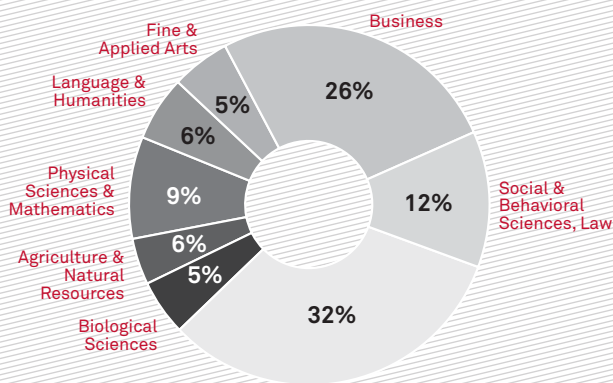
Bachelor's Degree Distribution

Bachelor's degrees awarded in the 2010–11 academic year

Southwest 4%
South 9%
West 14%
Midwest 8%
Middle States 20%
Northeast 45%
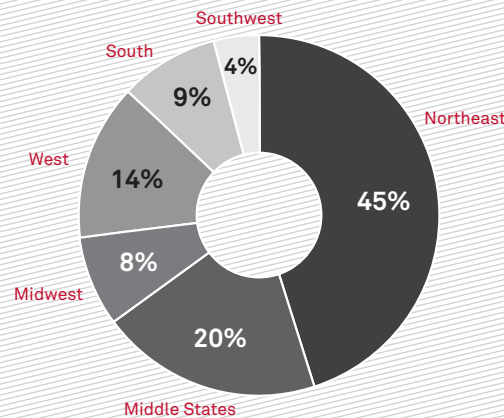
Engineering and Computer Science are the most popular disciplines at Cornell.
The College of Engineering has an undergraduate enrollment of over 3,000 and a graduate enrollment of almost 1,500.
Computing and Information Science has almost 400 undergraduates and over 300 graduate students.

**Policy of Equal Educational
and Employment Opportunity**

Cornell University has an enduring commitment to support equality of education and employment opportunity by affirming the value of diversity and by promoting an environment free from discrimination.

Association with Cornell, either as a student, faculty, or staff member, involves participation in a free community where all people are recognized and rewarded on the basis of individual performance rather than personal convictions, appearance, preferences (including sexual or affectional orientation), or happenstance of birth.

Cornell University's history of diversity and inclusion encourages all students, faculty and staff to support a diverse and inclusive university in which to work, study, teach, research and serve.

No person shall be denied admission to any educational program or activity or be denied employment on the basis of any legally prohibited discrimination involving, but not limited to, such factors as race, color, creed, religion, national or ethnic origin, sex, sexual orientation, gender identity or expression, age, disability, or veteran status. Cornell University is an affirmative action/equal opportunity employer.

Diversity

Adhering to Ezra Cornell's vision, Cornell has been at the forefront of higher education in embracing students, faculty and staff of all genders, backgrounds and ethnicities. Cornell is committed to extending its legacy of recruiting a heterogeneous faculty, student body and staff, fostering a climate that celebrates diversity and opportunities for learning from those differences.

Encouraging diversity in the student body as well as faculty and staff is a long-standing goal at Cornell. In 2000, Cornell renewed its commitment to diversity and inclusiveness by developing a new vision, "Open Doors, Open Hearts, and Open Minds," which has been endorsed by each of the University's constituent assemblies. In 2006, Cornell announced the formation of a University Diversity Council to deepen and reinvigorate the University's commitment to creating and sustaining an inclusive campus community.

The Fall 2011 is Cornell's most diverse class with less than half Caucasian; 13% of Cornell's total enrollment consisted of under-represented minorities. In the College of Engineering, women make up more than 25% of graduate enrollment and over 30% of undergraduate enrollment. In 2010, the College of Engineering reached an important milestone with a freshman class of 40% women. *Hispanic Magazine* and others have nationally recognized the Engineering College's Office of Diversity Programs for its success in attracting and supporting minority students and women in applied sciences.

Alumni Affirmations
Dan Chiao '02

College of Engineering, Department of Computer Science. VP of Engineering, Fliptop

"I completed my BSCS at Cornell in 2002 and immediately became a startup junkie. I have been one of the first technical hires at successive startups. My last startup, Like.com, was acquired by Google in 2010. My current startup, Fliptop (at which I'm the VP of Engineering), just raised a $2.4MM Series A and is on track to be profitable this year.

I feel that my Cornell degree has been a huge positive factor in my career. I've put Cornell's rigorous curriculum to use time and again in designing some of the most scalable distributed systems our industry--and in dealing w/ the pressure-cooker of startup life...I've observed time and again that Cornell grads have strong fundamentals, impressive work ethic, and (perhaps most importantly) don't flag under pressure. We're ideally suited for startup and entrepreneurial life."

A World-Class Partner

Cornell University is proud to be joining forces with one of the world's great academic institutions. The Technion - Israel Institute of Technology is a global leader in commercialization and technology transfer. This powerful combination of two applied-science powerhouses, together with Cornell's deep connection to New York City's emerging tech sector, holds amazing potential for positive impact on the city's economy.

Technion History and Core Strengths

The Technion is Israel's oldest university, with its first class admitted in 1924. Since that time, the university has awarded more than 90,000 degrees, and its graduating engineers, scientists, medical doctors, and architects have gone on to build the country's infrastructure and propel its social and economic development. Today the Technion is a global center of applied research consistently ranked among the world's top science and technology institutions.

The Technion has a long history of pioneering applied science and engineering research and development in Israel. One may begin with the establishment of the Faculty of Aeronautical Engineering in the fledgling State of Israel in 1953, a visionary step that galvanized the development of Israel's impressive aerospace engineering companies. At one of those companies, Israel Aerospace Industries, a majority of the applied scientists and engineers are still trained at the Technion. In the late 1960's, the Technion entered the sphere of micro-electronics and established a Faculty of Computer Science, which together provided the innovations and the manpower for Israel's highly sophisticated and economically successful high-tech industry sector. At the same time the Technion incorporated a Faculty of Medicine into its academic activities with the explicit desire to train medical students with technological understanding. A significant by-product of this step was the developing collaboration between applied science and engineering researchers with medical clinical faculty, leading to many innovations in medical devices and healthcare technology.

Technion laboratories enhance the country's economy by offering novel solutions, research facilities, and world-class expertise. Technion graduates have created Israel's industrial infrastructure, reinforced its defense capabilities, and pioneered its technology-based enterprises. International giants such as Google, Yahoo!, Intel, and IBM have been attracted to set up R&D facilities in Haifa in order to recruit quality Technion graduates. Technion alumni have devised the world's first wireless technology microprocessors; first intestinal pill camera; first stand-alone, anti-ballistic missile defense system; leading Internet search engines; the largest reverse osmosis desalination plant in the world; Intel main-line chip architecture (including the recent Sandy Bridge); invented the disk-on-key; and much more.

Current Campuses

The main campus is located in the Neve Sha'anan district in the city of Haifa, and

occupies 300 wooded acres, with 86 buildings providing over 4.5 million SF of usable space. The academic activity is carried out in 18 departments (most of which are called "faculties"), comprising some 55 distinct undergraduate programs and 80 graduate programs. The campus also has dormitory accommodation for 4,200 students including a brand new graduate student village consisting of 216 apartments for couples and families.

Apart from the main campus, the Ruth and Bruce Rappaport Faculty of Medicine is located in a 35,500 SF, 14-story building in downtown Haifa, adjacent to the area's main hospital.

The Technion is currently fitting out a new campus in the historic Sarona district of Tel Aviv, where the university already conducts a number of continuing education and external studies programs. The Sarona campus will consist of three restored landmark buildings providing a total of 17,200 SF for classrooms, computer laboratories, and offices.

Governance and Management Structure
The Board of Governors is the supreme authority of the Technion and comprises a maximum of 300 representatives from academia, government, employees, students and at least 60 public representatives who are residents of the State of Israel and at least 60 public representatives who are not residents of the State of Israel. A majority of all Board members must be Israeli residents.

The Council is the executive arm of the Board and is the directing and deciding authority during periods between sessions of the Board, in all matters other than purely academic ones. The Senate is the authority with respect to all academic matters, and comprises ex-officio members, 2 representatives from each of the 18 academic units, and elected general members from among the full-time tenured professors.

The Technion Management is headed by the President who is selected by a search committee chaired by the Chairman of the Board and comprised of members of the Board and of the Senate. The Council appoints the President for a term of 4 years, after formal consultation with the Academic Assembly (all tenured full professors). The appointment requires ratification by the Board. The President is also Chairman of the Senate. He may serve a

maximum of two 4-year terms.

The President selects Vice Presidents who are appointed by the Council after formal consultation with the Senate.

The Technion Management consists of the President and the following Vice Presidents:

- Senior Executive Vice President

- Executive Vice President for Academic Affairs

- Executive Vice President for Research

- Executive Vice President and Director General

- Vice President for Public Affairs and Resource Development

Faculty and Student Body
The Technion has 564 full-time tenure track academic faculty, and employs some 950 adjunct teachers who make up a further 240 full-time-equivalent (FTE) positions. In the Faculty of Medicine, 290 physicians hold part-time appointments amounting to 126 FTE positions. The total academic FTE position count is approximately 900.

The student body numbers some 12,800 students, of whom 9,000 are undergraduate and 3,800 are graduate students. The latter include some 940 PhD students and the remaining 2,860 in research or professional master degree programs.

Approximately 35% of undergraduate students are female, with lower percentages in most engineering faculties (~20%) and higher percentages in industrial engineering and management (50%) and in the biological and medical sciences. Approximately 20% of Technion students are from Arab minorities – corresponding to their proportion in the general population.

Education and Research Programs
The educational programs of the Technion include the study programs of each department, as well as a large number of joint programs. A table with the main undergraduate degree programs provided electronically.

Graduate studies at the Technion are managed by the Irwin and Joan Jacobs Graduate School, which is headed by the Dean of the School. Each of the academic departments is responsible for

providing the academic authority for the curriculum and staffing of one or more master degree programs. The latter are either research oriented MSc degrees (with thesis) or course-work Master of Engineering (ME) programs. The former also serve as an entry to the PhD programs – students who show high research potential are transferred to the PhD track after a year to 18 months of study and preparation of a research proposal.

The full list of master degree programs provided electronically. As well as departmental programs, there are multidisciplinary programs that are under the academic supervision of Inter-Departmental Committees. Those committees are highlighted in yellow in the table. They provide a vehicle for introducing new degree programs in a world in which graduate study specializations change and do not often fall neatly into a single department.

Several of these Inter-Departmental Commit-tees have been established in parallel with the recently introduced multidisciplinary research programs at the Technion.

In the past decade, the Technion has estab-lished several highly successful multidisciplinary research programs that have been based on significant research funding obtained from donors and philanthropic foundations, as well as from government. These include:

- The Russell Berrie Nanotechnology Institute – a $100M virtual institute that involves some 100 faculty and 80 graduate students, and provides infrastructure for research and development on campus and for industry.

- The Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering – a $50M virtual institute that attracted new faculty with applied physics and engineering back-grounds to work on the interface between life sciences and engineering.

- The Grand Technion Energy Program is a relatively new program composed of modules covering a broad spectrum of topics in alternative and sustainable energy sources. This $50M program is a quintessential example of an applied science research endeavor, involving materials science and engineering (e.g., photovoltaic research), applied biology (biofuels research), mechan-

Technion and Cornell–A Powerful Global Partnership

Cornell University and The Technion –Israel Institue of Technology are bringing together their strengths in academics and commercial-ization to form the Technion-Cornell Innovation Institute (TCII), an LLC especially created to encourage innovative programs on the New York City Tech Campus.

TCII, a truly unique partnership, will serve as the academic heart of the campus. The partners plan to collaborate on all aspects of the academic program, including teaching, research, and tech transfer. The memorandum of understanding, signed by both university presidents, may be found in the Section 1 Appendix. Key elements of the partnership include:

Research. All Technion research will be conducted under the TCII umbrella., while Cornell faculty may choose to do their research under TCII. All royalties for research conducted under TCII will be returned to TCII and co-owned by the two institutions.

Education. Initially, degree programs will be offered by Cornell, with Technion faculty participating as teachers. Once approval is received by New York State, dual degrees will also be offered by TCII.

TCII business model. It is anticipated that the two institutions will together solicit funds—by means of philanthropy, sponsored research, and ultimately tuition through dual degree programs — that will support direct and indirect costs of managing the campus. Note: TCII operations are not separately identified in Section 5. These will be defined further when the detailed partnership agree-ment, size and scope are finalized.

Future partners. A future Global Innovation Institute will be created to encourage additional partners from top world institutions to join Cornell and Technion on the campus and further accelerate innova-tion and economic development in the heart of New York City.

For the purposes of readability of this proposal, we have left the current and historical institutional descriptions of Cornell and the Technion distinct. The sections relating to the physical campus itself as well as the business model were written by Cornell, as the campus will be solely owned and managed by Cornell. However, the most important sections – those describing academic programs, research and commercialization – incorporate responses from both institu-tions. We believe this structure will help the reader best understand the nature of the partnership, while emphasizing the strength of TCII and its unique ability to contribute to New York City.

ical engineering (wind power research), applied chemistry (battery and fuel cell research), as well as other disciplines.

- The Technion Autonomous Systems Program is an example of a distinctly applied science and engineering research program. It is a $25M program pursuing research on topics such as unmanned aerial vehicles (UAVs) and satellites, unmanned ground and marine systems, autonomous medical systems, multiple autonomous agents, and household and industrial robotics. This program has attracted significant funding from industry.

- We are currently engaged in establishing the Technion Computer Engineering Center, which will enhance even further our cooperation with the IT industry, and will attract more students to computer architecture, computer systems, imaging sciences, and other areas of IT and computer engineering.

Alongside these research programs, the Technion has established master's and PhD degree programs which serve the dual purpose of providing manpower for conducting cutting-edge research on campus, as well as providing trained graduates who will transfer their research knowledge to the industries that develop in the relevant domains.

Based on this proven experience, Technion faculty and administration are well positioned to identify domains of applied science that have the potential to develop significantly in the near future. Moreover, Technion management knows how to attract and develop the core faculty and how to create domain-relevant educational programs in applied science and engineering.

Financial Aid and Scholarship Programs
Undergraduate and graduate tuition fees for Israeli residents/citizens are about US$3,000 per year, with another US$3,000 typically required for (single) dormitory accommodation. These amounts are not prohibitive for middle-class families. Most students prefer not to take loans – although they are available. However, a large number of undergraduate scholarships are available to either cover tuition and living expenses or contribute to their costs.

For overseas students, the Technion International School of Engineering (TISE) charges annual tuition of $15,000. Dormitories accom-

modation amounts to another $4,200 per year. Currently one third of these students receive scholarships.

Proportion of students receiving aid
Among undergraduates, many get financial aid in one form or another. Graduate students working towards a research degree (MSc or PhD) typically receive fellowships for the nominal duration of their degrees (MSc- 24 months, PhD- 48 months, and MSc+PhD direct track – 60 months). These scholarships include tuition as well as a reasonable living allowance.

Recruitment and Admissions Policy
The Technion is an equal opportunity employer, not discriminating with respect to gender, religion, race, nationality or sexual orientation. It operates subject to state laws with respect to the issuing of work permits for potential employees.

A similar policy holds with respect to student admissions. Undergraduate students are admitted based on their state matriculation grades and the results of a psychometric examination (like the SAT) administered by the National Institute for Testing and Evaluation. Foreign students are required to sit the latter exam in their mother language, and in many cases their own matriculation grades can be combined with these test results for deciding on admission. Students applying to the Technion International School of Engineering are carefully pre-selected to participate in a pre-academic program for 4 months – after successful completion of which they join the 4-year degree program.

Graduate students must have a recognized undergraduate degree, have a high enough GPA, and in some cases need to pass a specific test (e.g. GMAT). Candidates are interviewed by the admissions committee made up of members of the relevant Departmental or the Inter-Departmental Graduate Studies Committee.

Development Team

Cornell has been working with an outstanding development team on this proposal. The core team members are listed below, and more complete descriptions are included in the Section 1 Appendix. In addition to this core team, as described later in the proposal, we have been working with a number of potential development partners on the non-academic components of our proposal. Upon designation by EDC, Cornell will select its development partners and negotiate binding agreements, at which point they will complete the NYCEDC Background Investigation Forms.

EDC Background Forms for Cornell and The Technion can be found in the Section 1 Appendix.

Core Team

**Project Management/
Real Estate Strategy**
K. Backus & Associates, Inc.
Sirefman Ventures

Outreach/Government Affairs
Kasirer Consulting, LLC

Communications
BerlinRosen

Economic Impact
Appleseed

Architecture and Engineering

**Design Architecture/
Planning**
Skidmore, Owings & Merrill, LLP

Sustainability
In Posse

Landscape Engineer
James Corner Field Operations

MEP Engineer
AKF Engineers, LLP

Structural Engineer
Robert Silman Associates

Civil Engineer
Philip Habib Associates

Traffic, Parking, Transportation
Philip Habib Associates

Pre-Construction and Cost Estimating
Tishman Construction Corporation

Graphics/Environmental Design

Proposal Design
Two Twelve

Legal

Real Estate Counsel
Fried Frank Harris Shriver & Jacobson, LLP

Land Use Counsel
Kramer Levin Naftalis & Frankel, LLP

Development Partners/Advisors

Housing
Hudson/Related LLP

Capstone Companies

Hotel/Conference Center
Starwood Hotels & Resorts + Extell
Development Company

Thomson Hotels + The Pomeranc Group

Hotel Market/Feasibility Consultant
HVS Consulting and Valuation Services

Utilities/Central Plant
Distributed Sun, LLC

Decision-Making Structure (Cornell)

The Tech Campus is a significant priority for senior leadership at Cornell, and its planning and implementation will be overseen by leaders who will ensure its success. The NYC Tech Campus dean will work closely with an Executive Committee; an Operating Committee of senior administrative staff to oversee all aspects of the development and operating plans; and an External Advisory group.

Board of Trustees
The University Board of Trustees will be required to approve the operating and capital budgets of the NYC Tech Campus, in addition to any significant real estate transactions. Advice from the trustees will also be sought on the scope of activities at the Tech Campus, and on leadership appointments.

Role of the President
The mission of the NYC Tech Campus embodies the strategic objectives set forth by President David Skorton, a physician and scientist who has been an advocate and leader for partnerships between higher education and business and has actively worked for greater integration between Cornell's Ithaca and New York City campuses.

President Skorton is highly committed to this campus and will continue to work closely with the University Provost and others to help shape the program and mission of the Tech Campus. President Skorton is committed to spending on average 25% of his time in New York City, engaging Cornell alumni, the Board of Trustees, industry partners, and others to ensure that the NYC Tech Campus is sufficiently resourced and a top University priority.
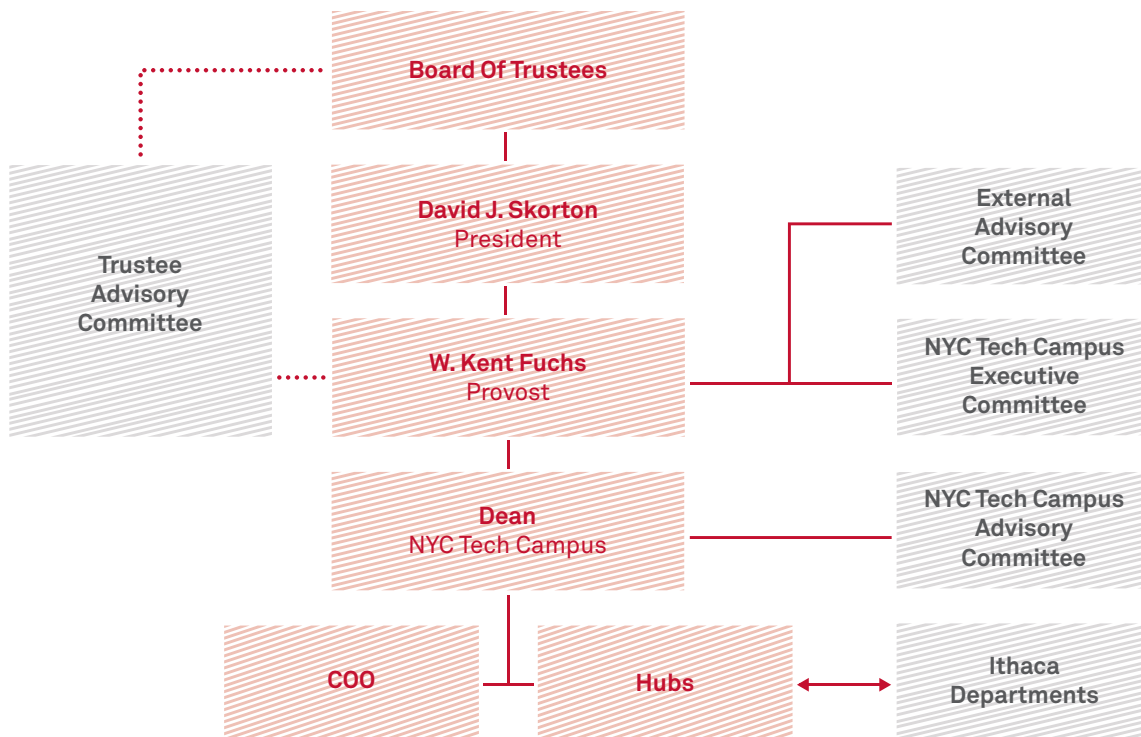
Role of the Provost
The University Provost, Kent Fuchs, will be actively involved in all aspects of the NYC Tech Campus. The Provost will chair the Executive Team that will be charged with developing the initial program, defining ongoing governance, and ensuring allocation of sufficient University resources. The Provost, as chief academic officer, will also be responsible for appointing the Tech Campus dean. Provost Fuchs is uniquely qualified to lead this effort as he previously served as Dean of the College of Engineering. In addition to his responsibilities as chief academic officer and chief operating officer of the University, his research interests focus on computer engineering, particularly dependable computing and failure diagnosis.

Cornell Executive and Advisory Committees
The University Provost has established an Executive Committee to guide the initial programming and development of the NYC Tech Campus. This committee will remain active throughout the operation of the Tech Campus. In addition to the President and Provost, this committee includes the deans of the programs most closely tied to the initial focal areas of the campus: Engineering; Computing and Information Science; Architecture, Art and Planning; Human Ecology, and the Johnson Graduate School of Management.

Augmenting the Executive Committee will be an Operating Committee comprising the offices of the Vice President for Finance, the Vice President for Planning and Budget, the Vice President for Human Resources, and the Vice President for Facilities Services.

External Advisory Committee
In addition to the internal comittees, Cornell will form an External Advisory Committee that will include technology industry leaders, Cornell alumni, New York City public officials and civic leaders, representatives of the New York City Economic Development Corporation, and other stakeholders. This committee will help guide program development, provide industry and government outreach, and serve as a liaison to the Cornell community.

NYC Dean
As soon as an agreement is reached with the city, Provost Kent Fuchs is prepared to name a NYC Tech Campus dean, who will be responsible for all facets of ongoing operations. The dean will immediately name a chief operating officer.

Together, they will establish temporary space in New York City and begin to search for faculty and staff. We anticipate the first employees will be in place within six months. The dean will be responsible for all academic and operating decisions at the NYC Tech Campus, including staffing, programs, and enrollment decisions. Graduate student policies and graduate degrees will be conferred under the auspices of Cornell University's Graduate School. Research and technology transfer policies and practices will be established and supported by the University Vice Provost for Research in collaboration with the dean of the NYC Tech Campus.

Faculty appointments will be made by the dean in collaboration with colleges and departments in Ithaca. While funding and staffing levels will be determined by the NYC Tech Campus dean, faculty tenure homes will be through Ithaca-based colleges. This is a model we have used extensively at the Ithaca campus to encourage interdisciplinary research and is similar to a model already in existence between some Ithaca colleges and Weill Cornell Medical College. Search committees will consist of faculty from both campuses, ensuring that new faculty will have support from colleagues in New York City and in Ithaca.

Alumni Affirmations
Hugo G. Fierro '05

Master of Engineering in Computer Science
Founder & CEO, Segondo Inc.

"After 5+ years working at Google, I quit to work on my first startup in Manhattan…Recent small scale tech campuses in NYC (e.g. General Assembly) have been quite useful and are clearly in high demand. I would be thrilled to see Cornell help develop a tech campus given the top quality and concentration of its graduates in NYC."

Decision-Making Structure (Technion)

For the Technion, the governance concerning the participation in the Project is divided between the Senate for academic issues and the Council for financial and strategic issues. The Senate (and its committees) will be required to approve and submit for accreditation new degree programs and be responsible for general oversight of faculty appointment procedures and degree awarding. The latter will be monitored by the Irwin and Joan Jacobs Graduate School of the Technion as all the programs envisaged for the TCII will be graduate programs – either dual master degree programs or dual PhD programs. The Technion will participate fully in the governance and decision making of the Technion-Cornell Innovation Institute. The Technion-Cornell Innovation Institute (TCII), will be constituted as a not-for-profit limited liability corporation (LLC).

While the proposed NYC Tech Campus on will comprise a wide range of facilities, its focus will be the applied science and research activity to be housed in the Technion - Cornell Innovation Institute.

TCII will be responsible for administering master degree programs, research and PhD programs, and technology transfer – all of which will be shared as joint efforts (e.g. dual degrees) of the Technion and Cornell University. The academic authority for the degree and research programs will derive from the appropriate authorities in the home institutions.

The governance of this institute is described in more detail below.

With respect to all aspects of designing and building the physical facility, Cornell will be the lead entity and lead negotiator with NYCEDC and the City, although Cornell will consult with the Technion on the design and allocation of space. Cornell will also be the owners of the physical facility and TCII will pay Cornell for cost of use of the facility.

Ongoing operations on the NYC Tech Campus will be divided between TCII operations and non-TCII operations. TCII operations will be subject to the governance procedures and management structure in the Terms of Agreement in the Section 1 Appendix.

1.04 Contact Information

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(607) 255-2364

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Making Big Things Happen

Cornell consistently ranks among the nation's top 10 universities in fundraising. With $4.32 billion in new gifts and commitments over the past decade, the University has shown a remarkable ability to grow and carry out ambitious projects in difficult times. The recent record also reaffirms our high level of comfort and confidence in dealing with the unusual challenges of development and construction in New York City.

A Tradition of Fundraising Excellence

Cornell's proposal for the NYC Tech Campus, and plans to raise funds for it, are supported by a long tradition of success in the development arena. The university consistently ranks among the top 10 institutions nationally in fund raising for higher education. Its greatest strength is in raising funds from individuals (alumni, parents, and friends), a category in which Cornell regularly ranks among the top 5 institutions.

The university has attracted some of the largest gifts ever from individuals—including $500 million from Sandy and Joan Weill for Weill Cornell Medical College, $80 million from David Atkinson to create the Atkinson Center for a Sustainable Future, and $50 million from Ratan Tata for scholarships for students from India and collaborative research in agriculture and nutrition. The university also benefits from the extraordinary generosity of such prominent philanthropists as Chuck Feeney '56, Irwin '54 and Joan '54 Jacobs, David Duffield '62, Howard Milstein '73, the S.C. Johnson, Tisch, and Dyson families, all of whom have helped shape the university through their financial support.

Over the past 10 years, Cornell has raised $4.32 billion in new gifts and commitments, $2.76 billion for the Ithaca campus and $1.56 billion for Weill Cornell Medical College in New York City. In 2006, Cornell launched its "Far Above" campaign. Over the course of that effort alone, the University has raised $3.35 billion in new

Going Up

The 480,000 SF, $637M Weill Cornell Medical Research Building, now rising at York Avenue and East 69th Street, is powerful evidence of Cornell's ability to fund and manage complex New York City projects.

Prior to initiating construction, the University spent nine months moving utilities beneath three old structures on the site. Power and low-voltage systems, along with underground steam mains supporting the hospital and an adjacent campus building, had to be relocated. Next came the abatement of hazardous materials to make the existing buildings safe for demolition. In the demolition process, small machines and hand tools were used to minimize disturbance to the surrounding community. Because of the depth of the bedrock, Cornell had to underpin and carefully monitor the adjacent buildings.

A tower crane has now been erected and above-grade construction has begun. When the facility opens in March 2014, it will almost double the research space of the Weill-Cornell campus.

gifts and commitments (on average, $448 million per year), nearly half of which has come from donors in the metropolitan New York area.

It is also important to note the University's recent success in fund raising for capital projects. Since launching its "Advancing the Clinical Mission" campaign in 2002, Weill Cornell has secured the funds necessary to construct two critical facilities. The Weill Greenberg Center—a 15-story, 330,000 SF facility—opened in 2007. The $230 million center encompasses research, educational, and clinical spaces, and provides a world-class health care environment for more than one million patients who visit annually for special-ized care. The College is also constructing a 16-floor, 480,000 square-foot Medical Research Building that will open in 2014. This building, which will ultimately cost more than $600 million, will double the college's research space and enable new medical treatments and cures.

In Ithaca, likewise, Cornell has made major investments in facilities over the last decade. Within the sciences, three facilities that re-establish the University's preeminence in the life sciences, physical sciences, and computer sciences have been or soon will be constructed. Weill Hall—a $163 million center for life sciences research and biomedical engineering, and the home of the Weill Institute for Cell and Molecular Biology—was dedicated in 2008. In 2010, the University opened a new $150 million Physical Sciences Building, which houses the University's top-ranked programs in physics, chemistry and chemical biology, and applied engineering and physics. Cornell will also soon break ground for William H. Gates Hall, a $60 million building that will house the Departments of Computer Science and Infor-mation Science.

In addition to these facilities, the University has invested $100 million in residential life over the last 10 years, substantially rebuilding and expanding its north and west campuses. It also recently opened Paul Milstein Hall (in the College of Architecture, Art, and Planning), a new building for the College of Human Ecology, and a new wing for its Herbert F. Johnson Museum of Art. Soon, the University will announce its plans to build a new humanities building on central campus, also funded entirely through philanthropic support.

In October 2011, Cornell announced its plans to expand its University-wide campaign to coincide with the University's sesquicentennial in 2015, with an adjusted goal of $4.75 billion. As a significant strategic university initiative, the NYC Tech Campus is a significant compo-nent of the campaign. We are confident that our campaign goals will be achieved, including those for the NYC Tech Campus.

Capital Campaigns of the Past 10 Years
Of the $4.32 billion in total gifts and commit-ments secured during that time, $2.76 billion was designated for the Ithaca campus, and $1.56 billion for the Weill Cornell medical campus in Manhattan. Nearly $900 million was specifically directed toward facility construc-tion, expansion, or renovation. In Ithaca, facility projects accounted for $340.6 million (20 percent) of the money raised; at Weill Cornell, they accounted for $556.0 million (35 percent) of the total.

WCMC "Advancing the Clinical Mission," 2000–2004
The goal of this plan was $750M and $751M was raised. Building on the success of Phase 1, WCMC entered into one of the largest capital campaigns ever undertaken by any medical school – a campaign, moreover, entirely dependent on the generosity of private donors. This Phase 2 campaign—intended to facilitate dramatic improvements in patient experience—included the construction of the new 13-story Weill Greenberg Center, an aesthetically pleasing and highly functional clinical facility designed to provide a soothing environment for the estimated one million patients who visit annually for specialty care. The center is also the site of unparalleled clinical, educational, and research initiatives.

"Discoveries that Make a Difference"
In Phase 3 of Strategic Plan—$1.3B targeted, with $1.07B raised to date—Weill Cornell has embarked on its greatest initiative to date. The most profound discoveries in modern day medical science will occur at the intersection of disciplines and through the collaboration of new ideas. The goal of the Phase 3 campaign is to translate these findings into the most advanced treatments for patients as quickly as possible.

Recent Projects
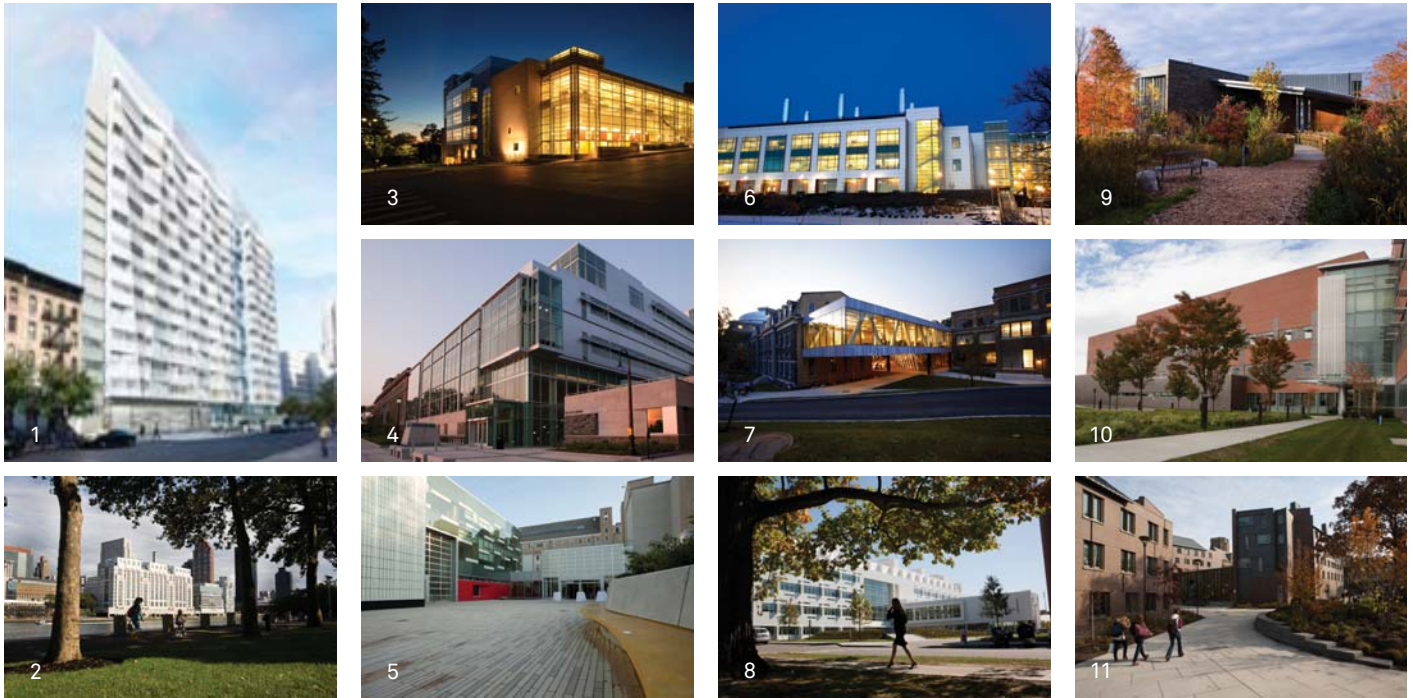
1. Weill Cornell Medical Research Building; 2. Weill Greenberg Center; 3. Beck Center Addition to Statler Hall; 4. Physical Sciences Building; 5. Martha Van Rensselaer Hall; 6. Duffield Hall; 7. Milstein Hall; 8. Weill Hall; 9. Cornell Lab of Ornithology; 10. Animal Health Diagnostic Center; 11. West Campus

Recent Projects – New York City

Project:	Weill Cornell Medical Research Building
Address:	413 East 69th St., New York, NY
Building type:	Research
Year completed:	Projected 2014
Project cost:	Projected $637,000,000
Construction cost:	Projected $340,000,000
Area (sq ft):	550,000
Architect:	Ennead Architects
Mechanical Engineer:	Jaros Baum, and Bolles
Structural Engineer:	Severud Associates
Builder:	Tishman Construction Company

Project:	Weill Greenberg Center
Address:	1305 York Avenue, New York, NY
Building type:	Outpatient clinical
Year completed:	2007
Project cost:	$229,802,900
Construction cost:	$131,717,500
Area (sq ft):	330,000
Architect:	Polshek Partnership (now Ennead Architects)
Mechanical Engineer:	AKF Engineers
Structural Engineer:	Severud Associates
Builder:	Bovis Lend Lease

Project:	**Southtown Residence**
Address:	465 Main St., Roosevelt Island, New York, NY
Building type:	Residential
Year completed:	2003
Project cost:	$44,069,900
Construction cost:	$41,816,000
Area (sq ft):	128,084
Architect:	Polshek Partnership (now Ennead Architects)
Mechanical Engineer:	SLCE Architects/Gruzen Samton Architects & Planners
Structural Engineer:	Severud Associates
Developer:	Hudson Companies/Related Companies
Builder:	Monadnock Construction

Project:	**Citigroup Biomedical Imaging Center**
Address:	515 East 71st St., New York, NY
Building type:	Research imaging
Year completed:	2002
Project cost:	$17,863,000
Construction cost	$14,723,000
Area (sq ft):	15,692
Architect:	Shirley Sherak Architect Planner
Mechanical Engineer:	Jaros Baum, and Bolles
Structural Engineer:	Severud Associates
Builder:	Morgan Construction Enterprises

Recent Projects – Ithaca

Project:	**Herbert F. Johnson Museum of Art Addition**
Address:	Cornell campus, Ithaca, NY
Building type:	Museum
Year completed:	2011
Construction cost:	$19,000,000
Area (sq ft):	25,340

Project:	**Martha Van Rensselaer Hall**
Address:	Cornell campus, Ithaca, NY
Building type:	Academic (Research, Laboratory, Classrooms)
Year completed:	2011
Construction cost:	$71,100,000
Area (sq ft):	87,000

Project:	**Milstein Hall**
Address:	Cornell campus, Ithaca, NY
Building type:	Academic (Research, Laboratory, Classrooms)
Year completed:	2011
Construction cost:	$55,500,000
Area (sq ft):	46,500

Project:	**Animal Health Diagnostic Center**
Address:	Cornell campus, Ithaca, NY
Building type:	Laboratory Facility (Research, Laboratory)
Year completed:	2010
Construction cost:	$80,500,000
Area (sq ft):	125,000

Project: **Physical Sciences Building**
Address: Cornell campus, Ithaca, NY
Building type: Academic (Research, Laboratory, Classrooms)
Year completed: 2010
Construction cost: $197,00,000
Area (sq ft):   272,350

Project: **Weill Hall**
Address: Cornell campus, Ithaca, NY
Building type: Academic (Research, Laboratory, Classrooms)
Year completed: 2008
Construction cost: $157,000,000
Area (sq ft):   272,350

Project: **West Campus (five residence halls)**
Address: Cornell campus, Ithaca, NY
Building type: Residential
Year completed: 2004–2008
Construction cost: $225,300,000
Area (sq ft):   610,340

Project: **Beck Center addition to Statler Hall**
Cornell campus, Ithaca, NY   Cornell campus, Ithaca, NY
Building type: Academic (Research, Classrooms, Conference)
Year completed: 2004
Construction cost: $16,300,000
Area (sq ft):   35,000

Project: **Duffield Hall**
Cornell campus, Ithaca, NY   Cornell campus, Ithaca, NY
Building type: Academic (Research, Laboratory, Classrooms)
Year completed: 2004
Construction cost: $58,500,000
Area (sq ft):   153,000

Project: **Cornell Lab of Ornithology**
Cornell campus, Ithaca, NY   Sapsucker Woods Rd., Ithaca, NY
Building type: Research, Offices, Sound Library, and Visitor Center
Year completed: 2003
Construction cost: $32,000,000
Area (sq ft):   90,000

Project: **Friedman Wrestling Center**
Address: Cornell campus, Ithaca, NY
Building type: Athletics Center
Year completed: 2002
Construction cost: $3,500,000
Area (sq ft):   16,400

Project: **Robert J. and Helen Appel Commons**
Address: Cornell campus, Ithaca, NY
Building type: Community Center
Year completed: 2001
Construction cost: $11,000,000
Area (sq ft):   62,000

Development & Fundraising Experience (Technion)

Background:
Technion's Fundraising Capabilities
Over the decades, the Technion has built an extensive and successful international resource development network based on Technion "societies" – friends organizations devoted to raising funds for the Technion and promoting ties with industry, academia and government. The main – but by no means exclusive – source of philanthropic support for the Technion is among the Jewish communities throughout the world.

A growing percentage of Technion's fundraising is coming from alumni. This is a fairly new phenomenon in the Israeli philanthropic arena.

During the period 2005-2010, the average annual net income received by the Technion from its worldwide societies was $77,460,000. These funds supported the Technion operating budget and a wide variety of projects, including physical development, research, graduate fellowships, undergraduate student aid, community outreach, and more.

Technion societies exist in Israel, North America, Europe, Australia and Latin America. By far the largest and most important of the Technion societies is the American Technion Society (further detail about this, below).

Following are several examples of major capital and research projects undertaken by the Technion in recent years:

Life Sciences and Engineering
The Emerson Family Life Sciences Building is a newly completed 8-story building, covering an area of approximately 93,600 square feet. The building houses the Center for Research Resources in Life Sciences and Engineering, many laboratories, offices, seminar and meeting rooms, and a cafeteria.

The total cost of this project is approximately $25.5 million, of which about $22.5 million has already been raised, about half by the American Technion Society.

Zielony Graduate Student Village
Since Israeli graduate students are often married, and sometimes with young children, many face the financially daunting task of continuing academic work while supporting families.

To tackle this challenge, the Technion has created an innovative community called the Zielony Graduate Student Village, which comprises seven dormitories containing 216 one- and two-bedroom apartments, most of them intended for married couples and families with children. The Village site is on the Technion campus, and is adjacent to a neighborhood that offers diverse social and community services, shopping, schools, health clinics, community centers, parks, and recreational facilities.

The cost of this project is about $35 million, of which about $32.7 million has been raised so far. Of this, the American Technion Society has raised over $11 million.

Energy Research: The Nancy and Stephen Grand Technion Energy Program
The Nancy and Stephen Grand Technion Energy Program is bringing together science and engineering researchers to work in a broad interdisciplinary track to discover and exploit alternative and renewable energy sources, to search for and develop alternative non-carbon based fuels, to seek solutions for more efficient energy use, and to reduce the environmental damage caused by the production and burning of fossil fuels.

The cost of this project is $56 million, of which about $34 million has been raised so far. Of this, $28.6 million was raised by the American Technion Society.

The American Technion Society (ATS)
Since its founding in 1940, the ATS has raised more than $1.6 billion on behalf of the Technion. In 2009 the ATS completed a $1 billion campaign called "Shaping Israel's Future." This goal was achieved despite a difficult environment during the last years of the campaign. Since then, in fiscal 2010 and 2011, the ATS has raised another $150 million.

Based in New York City, the ATS is a major-gifts fundraising organization, which has experienced a steady increase in the number of gifts of $1

million and more over the past decade. ATS professional staff has expertise in attracting major donors by matching the university's funding opportunities to their interests.

Major ATS Capital Projects

D. Dan and Betty Kahn Mechanical Engineering Building. To accommodate the needs of the rapidly expanding Faculty of Mechanical Engineering, the Technion is constructing the D. Dan and Betty Kahn Mechanical Engineering Building, which will house facilities including classrooms, the departmental library and auditoriums. ATS fundraising total so far: $16,287,070.

Eastern Village Dormitory. In a major expansion of on-campus housing, the Technion added 10 new buildings to the Eastern Village Dormitory. The 17-building complex is now home to more than 1,000 students. ATS fundraising total: $22,847,169.

Major ATS Research Projects

Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering. In an initiative spearheaded by Nobel Laureate Professor Aaron Ciechanover, the Technion is devoting significant resources to life sciences research, particularly engineering and biomedicine. The Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering was established to nurture convergence science that integrates life sciences, engineering and exact sciences. ATS fundraising total: $30 million.

Alfred Mann Institute for Biomedical Development at the Technion (AMIT). The Alfred Mann Institute for Biomedical Development at the Technion was established to turn innovative technologies developed by Technion researchers into medical devices, pharmaceuticals and biologics. AMIT screens and evaluates research projects with commercial potential. ATS fundraising total: $20,180,000.

David and Janet Polak Center for Cancer Research and Vascular Biology. Headed by Nobel Laureate Professor Aaron Ciechanover, the Polak Center was established to promote interdisciplinary basic and clinical research on the control of cellular and molecular processes involved in cancer initiation and progression. Ongoing research may lead to the development of new drugs to treat cancer of the colon, breast and prostate, and melanomas. ATS fundraising total: $8,352,869.

Sohnis and Forman Families Center of Excellence for Stem Cell and Tissue Regeneration Research. The Technion is at the forefront of embryonic stem cell research, led by pioneer Professor Joseph Itskovitz-Eldor. The Sohnis and Forman Families Center is where researchers have already turned embryonic stem cells into various cell types, including muscle and blood vessel cells for future replacement parts, and are successfully growing stem cells into beating heart muscle and cardiac cells that create their own blood supply. ATS fundraising total: $3,770,264.

ATS Graduate Student Campaign Irwin and Joan Jacobs Graduate School. Graduate students are essential to the Technion's mission as a leading academic and research university. They perform research, serve as teaching assistants and attract first-rate faculty. The university is therefore committed to increasing the graduate student population by providing fellowships and first-rate facilities. ATS fundraising total: $32,494,650.

ATS Faculty Recruitment Campaign Taub Family Leaders in Science and Technology Program. Created to recruit top faculty members to the Technion, the Taub Leaders in Science and Technology Program offers talented young researchers an attractive compensation package that includes a state-of-the-art laboratory. ATS fundraising total: $25,000,000.

Russell Berrie Nanotechnology Institute (RBNI). A generous gift by the Russell Berrie Foundation allowed the Technion to leverage significant matching funds from the government of Israel and from philanthropic sources, enabling it to establish a major institute for nanotechnology research and development. RBNI is aimed at recruiting new faculty members from research labs around the world; extensive investment in infrastructure; creating new educational programs for training the next generation of scientists and engineers, and nurturing of multidisciplinary collaborations within the Technion, as well as with industry and other academic institutions in Israel and internationally.

The overall cost of this project is $88 million, including matching funds and research grants. So far, about $52M has been raised, of which over $27 million was raised by the ATS.

Institutional Decision-Making and Internal Approvals

Approval Process

The Cornell Board of Trustees, in a special meeting on October 12, 2011, expressed its strong and unanimous endorsement of the NYC Tech campus project, and authorized the designated senior leadership to negotiations with NYCEDC. Senior leadership will keep the Board of Trustees fully informed on the progress of the negotiations and status on project arrangements. (See Board of Trustees Resolution in the Section 1 Appendix).

At the same meeting the board unanimously approved the partnership and term sheet with the Technion, which establishes Cornell as the respondent responsible for all negotiations and assumption of responsibility with the EDC. Following Cornell-EDC negotiations of mutually satisfactory Project Agreements, the Executive Committee of Cornell's Board of Trustees will review and approve the essential elements of these transaction documents before being executed on Cornell's behalf.

When an individual parcel on the Roosevelt Island site is ready for construction, as described in the "Development Structure" (in Section 2), the proposed terms of the sublease and construction completion guarantee to be negotiated with a Cornell entity or third-party developer will be reviewed and approved by the Cornell Board of Trustees (or by a delegated Board Committee).

Once the project agreements are fully executed, the NYC Tech Campus dean will be responsible for most of the operational decisions of the campus. See Section 3.04 for a description of campus leadership.

Background

We are delighted but not surprised to have received overwhelming and broad-based support for the NYC Tech Campus. Students, faculty, administrators, alumni, and trustees alike recognize the importance this campus has for the future of Cornell University, as well as the value and success that Cornell can bring to New York City.

The strong endorsement from the trustees is the culmination of a great number of public and private meetings, discussions, and communications with many groups and individuals. Early

Timeline Summary

	2011	2012		2013		2014		2015		2016	
	December	January	July	January	July	January	July	January	July	January	July
Designation/execute predevelopment agreement	■										
Dean appointed	■										
Phase 1A -in current CU or leased space		■	Students active on campus →								
NYS approval of existng Cornell degrees		■	■								
Technion Cornell implement partnership details		■	■	■	■	■					
NYS approval of new Technion/Cornell dual degrees								■	■	■	■
Phase 1B Design and Construction		■	■	■	■	■	■	■	■	■	■
Phase 1C Design and Construction											
Phase 2 Design and Construction											
Phase 3 Design and Construction											

in the expression of interest stage, President Skorton and Provost Fuchs communicated with various constituencies about the opportunity and heard valuable feedback and advice. Upon the release of the RFP, the Provost and lead team members updated key constituencies about the project plans and gained the necessary approvals to proceed.

To gain formal approval from the Cornell Board of Trustees, Provost Fuchs presented information to the full board on May 27, 2011, with the university's plans for the NYC Tech Campus. Cornell administration then met on June 16 with the board's Executive Committee to present an updated overview of the campus, and again on September 6 to discuss the proposed business model for the project. On October 11–12, special board meetings occurred to gain formal approval from the Executive, Buildings and Properties, and Finance Committees, and from the full Board of Trustees.

From an internal governance perspective, other endorsements necessary for the project's success came from the Faculty Senate and Student Assembly. In August, Provost Fuchs met with the Faculty Senate's Committee on Academic Programs and Policies (CAPP) to discuss the project and hear feedback and concerns. CAPP then provided Provost Fuchs with a detailed advisory report. The Provost

presented an update to the full Faculty Senate on September 14, sharing additional detail about the scope and academic program of the Tech Campus. Project materials have been available for all faculty members to review.

On September 8, entirely without administrative involvement, the Student Assembly unanimously approved a resolution to support Cornell's bid for the Tech Campus. See the Resolution provided electronically. Indeed, there has been a tremendous amount of grassroots support. Students have been vocal about their support for the NYC Tech Campus initiative, even creating videos, blogging, running events in New York City, and soliciting endorsements to share their enthusiasm.

Trustees, alumni, faculty, and graduate students also were involved in the project from the beginning of the process. See the Graduate Student Resolution provided electronically. An advisory group made up of trustees and key alumni have met with the Provost and lead administrators monthly throughout the proposal process. More than 30 faculty were directly involved in creating the academic hub programs, and an advisory group of graduate and professional students provided input on the Tech Campus as the project developed. These groups will be instrumental in the roll-out of the new campus.

2017		2018		2019		2020	2023		2024		2025		2026		2027	2033		2034		2035		2036		2037
January	July	January	July	January	July	January	January	July	January	July	January	July	January	July	January	January	July	January	July	January	July	January	July	January

Institutional Decision-Making (Technion)

The two main oversight authorities of the Technion are the academic Senate and the Council. In matters that have both academic and administrative/financial aspects, the Council receives the Senate's opinion before discussing and deciding.

The Senate is responsible, through its committees and officers, for appointing, promoting and tenuring academic faculty; for approving degree programs and curricula; for student admission's policy; and for granting of degrees. The Senate will also make recommendations to the Council on academic administration issues – establishment or closing of departments, institutes, research centers, etc. All of the above are to be carried out within the budget framework ultimately approved by the Council.

The Council, a 19 member body consisting of Chairman (a public figure), President, Senior Executive Vice-President, Senate representatives and public figures, meets regularly throughout the year, and also operaties various committees. The Council acts like a Board of a company, overseeing financial, physical infrastructure, and administrative and audit functions. It also discusses and decides on major strategic initiatives.

The current project of participating in the responses to the RFEI and RFP for establishing an Applied Sciences Research Facility in New York City, was debated in the Senate and the Council at both stages (RFEI and RFP). The

Technion management received strong support to proceed with the project, in particular based on the agreement on partnership principles that was negotiated with Cornell concerning the establishment of the Technion-Cornell Innovation Institute (TCII) on the Roosevelt Island campus. Note that the Senate debate was open to elected Senate members as well as all full professors of the Technion – adding a significant dimension to the overall support that the project received from the faculty.

Given this support for both the concept and implementation principles, we do not foresee any obstacles to receiving the required approvals for future project developments, as long as the latter do not deviate from the currently accepted principles. The Senate committees, based on a recommendation of the Graduate School, will be required to approve the curricula for the proposed dual degree Master in Applied Science program. Senate committees will be required to approve individual academic faculty appointments – either full-time or adjunct ones. These processes are streamlined in the Technion. The Senate and the Council will be required to approve the members of the Board of the TCII, and the choice of its director. The Council will ultimately need to approve the detailed business model for TCII.

Intensely Involved

For decades, Cornell's leaders have championed community service as an integral part of the University's mission. That commitment takes many forms, including a remarkable set of initiatives (quite a few of them already operating in New York City) to elevate the quality and appeal of K-12 science, math, and engineering instruction, while opening doors of professional and economic opportunity to an expanded talent pool.

As New York State's land-grant university, Cornell goes to extraordinary lengths to share its knowledge and facilities with people, communities, and companies and industries, from farming and food processing to software development and biotech.

One measure of the breadth and depth of our outreach: the upwards of 7,000 Cornell students and 150 faculty members who annually participate in one or more of the many programs of the Cornell Public Service Center. Another measure: earlier this year, Cornell won the nation's top award as an "institution of community engagement" from the Carnegie Foundation for the Advancement of Teaching, whose classifications of colleges and universities are considered a gold standard. (The Technion has its own strong story of community-relations commitment and accomplishment, summarized in the next subsection.)

Reaching Out All Over

Cornell's community service efforts are wide-ranging in purpose as well as geography. The university runs programs, among many other things, to support food security and healthy communities; help managers, workers, and policymakers deal with difficult labor and workplace issues; expose economically disadvantaged kids to the world of art; teach

and cultivate sound nutrition; and provide short- and long-term recovery assistance for the victims of such calamities as the floods that devastated large areas of upstate New York this year.

While all of Cornell's colleges do outreach of one kind or another, no single program reaches as many communities and people – or speaks as powerfully to the University's sense of mission - as the Cornell Cooperative Extension, with its multitude of efforts to improve lives through partnerships that put experience and research knowledge to work.

The nationwide network of Cooperative Extension programs began in 1914 as a means of bringing the fruits of land-grant university research to farmers and rural families. Today, led by faculty and staff in the colleges of Human Ecology and Agriculture and Life Sciences (with help from colleagues in the College of Veterinary Medicine), Cornell Corporative Extension (CCE) serves urban, suburban, town, and rural areas with scores of programs operating around the state. In New York City, CCE supports school and community gardens, teaches urban forestry, runs healthy-cooking demonstrations, takes teenagers on natural-history tours, and trains parks workers in landscape gardening and horticulture,

Cutting a Wide Swath

Through the Cornell Cooperative Extension's 56 offices, students from the Colleges of Human Ecology and Agriculture and Life Sciences connect with residents and businesses across a wide swath of the state. The Agricultural Experiment Station in Geneva, along with its substations in Fredonia, Highland, and Riverhead, offer opportunities for students focusing on conservation and ecology to conduct research and apply it to local agricultural efforts. Cornell's Lab of Ornithology in Ithaca, Animal Science Teaching and Research Center in Hartford, and Duck Research Laboratory in Eastport promote advances in animal disease control and husbandry. The Arnot Teaching and Research Forest provides training and application opportunities for forestry students. Cornell's Biological Field Station in Bridgeport gives students a chance to conduct and apply research on freshwater lacustrine systems.

among many other activities. On Manhattan's West 50th Street, CCE is a large presence in the daily life of the 400-student Food and Finance High School, which it helped create along with the City's Department of Education. Thanks to a recent appropriation of City funds, the school will soon have a 4,500 square-foot rooftop garden (in addition to a fish farm and hydroponics lab), where Cornell scientists will be "showing us how to grow food outside of traditional farms," in the words of City Council Speaker Christine Quinn.

K-12 Support

In subsequent sections of this proposal, we outline a number of ambitious outreach efforts, many focused on K-12 education, that are envisioned as part of the NYC Tech Campus initiative. In education as well as community service generally, Cornell's track record gives New York City and New Yorkers plenty of reason to take our commitments seriously. A few highlights:

CNS Institute for Physics Teachers (CIPT)

The CIPT develops engaging laboratory activities, and provides workshops and graduate courses for high school physics teachers. Since the program's inception in 2001, 1,800 teachers have participated in more than 80 workshops, while more than 200 teachers have taken courses. Lab activities, developed by teams of high school teachers, Cornell graduate students, and researchers, extend to such topics as nanoscience, electricity and magnetism, waves, particle physics, quantum physics, and optics. The University operates similar programs for biology and chemistry teachers.

CCMR Research Experience for Teachers

CCMR's Research Experience for Teachers (RET) provides middle school, high school and community-college math and science teachers with an intense, six-week program of in-depth study. Six select science teachers spend the first five weeks primarily in the CCMR Shared Experimental Facilities, working as a team to learn the workings of the equipment and solve research problems set out by the facility manager. The sixth week is dedicated to developing a materials science lesson plan based on their experience.

Graduate Student School Outreach Program (GRASSHOPR)

This program, sponsored by the Cornell Public Service Center, allows graduate and professional students to share their knowledge (and some university resources) with elementary, middle, and high school students. GRASSHOPR mini-courses typically run for 3-5 weeks (one class period each week) between March and June.

Catalyst Academy

Designed to advance diversity in engineering and related disciplines, this is a one-week summer residential program for rising high school sophomores, juniors, and seniors. Applications from African American, Latino/a, or Native American students (all critically underrepresented groups) are especially encouraged. Cornell faculty and graduate students lead classes, lab sessions, and project research. Social events, panel discussions, and other out-of-classroom activities provide students with informal networking opportunities. Financial assistance for tuition, room and board, and research supplies (normally $1,450 altogether) is available based on demonstrated need. (The Curie Academy is a similar program for high school girls - sophomores and juniors.)

Raising Education Attainment Challenge (REACH)

In this student-run initiative, volunteers provide tutoring, mentoring, and teaching in all subjects and disciplines. Operating in over 25 pre-K to 12th-grade settings around the state, the program recruits and mobilizes a diverse group of work-study and volunteer tutors, supplying them with the resources, peer support, and leadership to have a meaningful impact on academic achievement .

HISPA: Hispanics Inspiring Students' Performance and Achievement

Run by a Cornell alumna, Dr. Ivonne Díaz-Claisse (founder of the consulting firm ID Educational Solutions), HISPA mobilizes Latino professionals to serve as active role models in local educational programs. The program focuses on public schools with substantial Hispanic populations.

Up and Running in New York City

Cornell University already contributes in a variety of ways to the strength and vitality of

New York City's economy. The University's medical school – Weill Cornell Medical College – has been located in New York City since its founding in 1898. The School of Industrial and Labor Relations, the College of Architecture, Art and Planning, the College of Human Ecology, Cornell Cooperative Extension and other divisions of the University also have ongoing operations in the City.

In addition, Cornell is involved in a number of city-specific initiatives. They include:

The Community and Regional Development Institute (CaRDI)
Through collaborative efforts to identify opportunities for economic growth and enhanced university-industry partnership in technology- or knowledge-transfer, CaRDI promotes entrepreneurship, innovation, and regional economic competitiveness in the southern tier of New York.

The Algebra Project
Founded by Cornell math professor David Henderson in 2008, the Algebra Project provides high-school curriculum materials and professional development for teachers. A special experiential curriculum is currently being developed in collaboration with two Bronx high schools: Banana Kelly and Fanny Lou Hamer. As part of this effort, a student cohort will be tracked through their high school years.

Cornell Science Sampler Series (CSSS)
Offered by the Weill Cornell Medical College, these one-day professional development workshops draw on many of the university's other education and outreach programs.

Health and Wellness Seminar Series
The Health & Wellness Seminar Series is a biannual community outreach program that typically addresses current medical topics with a focus on wellness and prevention. The highly successful series routinely fills Uris auditorium with approximately 200 attendees. Audience members come from all over the New York metropolitan area and are primarily a lay demographic of 40/50-plus year olds. The typical seminar format is two 30-minute presentations followed by a 30 minute Q &A period. We send out 10,000 postcards, email blasts, post on the Medical Center's website, place posters at key locations at both the Hospital and College, list it in our Community

Newsletter and place ads in Our Town (free Community Newsletter). We also send flyers to our elected officials and other key community groups.

Family Festival at Stanley Isaacs Neighborhood Center
The Stanley Isaacs Neighborhood Center reaches across generations and ethnic groups to serve more than 6,000 inner city youngsters, adults, senior citizens and their families. The family festival's goal is to improve the physical, educational, and social well being of the community. NewYork-Presbyterian/Weill Cornell participated in the event by distributing health related information materials, and offering free blood pressure screenings to nearly 100 attendees.

College Achievement Through Science Exploration (CAUSE)
A joint venture of Cornell University Cooperative Extension - New York City and Henry Street Settlement , funded by the Teagle Foundation, CAUSE seeks to improve the college readiness skills of minority youth from low-income communities by combining environmental studies, research, field study and community service with intensive college preparatory services. In addition to designing and conducting the independent research projects, participants were introduced to environmental science, alternative energy, the urban environment, scientific research and communication via 36 weekly sessions with an instructor and a three-week, three-credit environmental science college-level course in the Cornell Summer College program in Ithaca.

WCMC Burn Education Initiative
This program provides outreach for groups such as firefighters, children, and foster parents—to prevent burns among high-risk populations and to promote community understanding and empathy for the needs of recovering burn victims. Its work was among factors recently leading to the fewest civilian fire deaths in New York City in 90 years.

Economic Impact
The resources that Cornell contributes to the economy of New York did not appear overnight. They are the product of decades of investment—public, private, intellectual, and financial. As a result, Cornell today is one of New York State's largest non-governmental

employers and a significant contributor to the economic vitality of both New York City and Central New York State. Directly and indirectly, the University accounts for approximately $3.3 billion in annual economic activity, and 36,600 jobs, across the state.

Cornell employs approximately 5,200 people in New York City (about 95 percent of them at Weill Cornell), with a payroll of approximately $500 million. Cornell also creates jobs through its purchases of goods and services from local vendors. University purchasing from companies in New York City totaled more than $200 million in fiscal year 2011.

From fiscal year 2006 through fiscal year 2011, Cornell invested nearly $551 million in construction of new and renovation of existing facilities in New York City, including more than $97 million in fiscal year 2011. Cornell's fiscal year 2011 construction spending directly supported approximately 278 full-time-equivalent (FTE) jobs in New York City in construction and related industries.

From fiscal year 2012 through fiscal year 2015, Cornell plans to invest an additional $552 million in its facilities in New York City – an average of more than $138 million annually, directly supporting an average of 395 FTE jobs each year in construction and related industries.

Over a ten-year period (fiscal year 2006 through fiscal year 2015), Cornell's investment in construction and renovation of its New York City facilities will thus total approximately $1.1 billion. The impact of this investment goes well beyond the opportunities it creates for the City's construction contractors and workers; it also enhances the University's ability to fulfill its mission.

Funding

Most funds expended by Cornell for community engagement are formally planned and budgeted on an annual basis. The 2008–2009 actual expenditures in the Extension and Public Service function totaled $110.9 million, excluding Weill Cornell Medical College in New York City, or 6.1 percent of total operating expenditures.

Fundraising activities also contribute. Cornell's School of Industrial and Labor Relations targets 11.6 percent of its fundraising activity to outreach and engagement, generating a total of $1.5 million over the last two years. The Johnson Museum of Art has raised approximately $2.2 million per year over the past decade to support community engagement and education. Endowment and gifts generated about $500,000 in support of the Meinig Family National Scholars program, preparing 192 students for leadership roles in their communities. About $2 million from endowment/gifts supported Cornell Tradition students in some 54,000 hours of campus and community-service work in the 2007–2008 year alone.

Community Impact (Technion)

The Technion sponsors a variety of outreach programs through its Center for Pre-Academic Education. These include: short and longer term (1 year) preparatory courses for those who have no, or poor, matriculation grades; a special preparatory course for high-achieving students from the Arab sector; a 15-month preparatory course for men from the ultra-orthodox sector; as well as special programs for students from the geographical and economic periphery, both before and after their compulsory army service. It is noteworthy that the Technion has the same proportion of Arab students as that of the Arabs in the general population of Israel —about 20%. The Center also runs several programs for high

school students with the aim of promoting STEM (Science, Technology, Engineering and Math) subjects, including hosting students in laboratories and sending mobile laboratories into cities and towns in the north of Israel.

During the 2010-11 academic year, as many as 80 Technion employees took part in a new and unique community project initiated by Technion management. The core of the project, now entering its second year, is monthly visits of Technion volunteers to a number of after-school centers in the nearby, low-income town of Nesher. During these monthly sessions, Technion employees help the children, elementary

school pupils from disadvantaged backgrounds, with their homework, prepare and deliver enrichment activities, organize events and lectures and grant the children the much needed individual attention. The project received support from Israel's Ministry of Education and the Nesher Municipality and is rendered part of their joint drop-out prevention effort. Every volunteer gets assigned to a particular after-school center and invests at least 4 hours every month. Technion management provides for a variety of incentives for volunteering employees through allocation of work hours and organization of social activities for project participants. Throughout the year, the children take part in a variety of activities on Technion campus, attended by members of Technion management and faculty.

Since 2007, Technion has been actively involved in the European Scientists' Night Project sponsored by the European Commission. This free-of-charge event conducted simultaneously at hundreds of locations all around Europe and Israel encompasses a variety of "edutainment" activities and offers the general public a unique opportunity to acquaint themselves with researchers and their magic world. Dozens of labs, universities, enterprises, foundations open their doors and unveil their secrets Europe wide, allowing each visitor, "hand in hand" with researchers, to be scientist for a night, take part in mysterious and fascinating experiments, use sophisticated instruments, understand the magic of science and its beauty and ask any question they always wanted to ask without daring before. Every year, Technion faculty and staff take part in the Researchers' Night activities taking place all over the city of Haifa, including Technion campus, thereby contributing their knowledge and expertise to the education of a new generation of scientifically knowledgeable people and actively raising awareness to the importance of science and technological innovation to Israeli economy.

According to a recent initiative of the Technion Student Association approved by the Technion Senate in November 2010, students can now receive academic credits for their voluntary activity. Thus, an undergraduate who spends 2 hours a week volunteering in a recognized community project receives one additional academic credit per semester. This regulation also applies to students serving in reserve duty for at least 15 days in any given semester.

Technion's Department of Education in Technology and Science is home to a host of community initiatives. One of the recently developed projects, called Educational-Scientific Clinic, enables students from all Technion faculties to contribute to in-class STEM education of junior high and high school pupils, as assistant teachers in their chosen professional fields. The students' unique contribution as part of the pupils' in-class experience will encompass individualized preparation for matriculation exams, small group instruction, assistance in final project writing and other types of teaching activities tailored to the needs of the target population. The participants will be offered a specially designed training and enrichment program as part of which they will acquire knowledge and skills in such fields as teaching methods, learning mechanisms, motivation theories, verbal and non-verbal communication and other.

An additional important community involvement platform at Technion is its alumni association which operates a number of social responsibility frameworks aimed at harnessing the enormous human potential of Technion graduates for the benefit of Israeli society. One such project, called "Poalim 3 to 5", currently operates in 22 towns and cities countrywide and aims to increase the number of junior high and high school students who choose to major in STEM subjects for their matriculation exams. Technion graduates, most of them engineers employed by top-rank high-tech companies, are recruited and trained to deliver complementary classes and tutorials to enhance their pupils' scientific background and ultimately enable them to successfully pass their matriculation exams in these subjects. The project is designed to cater to the needs of pupils from disadvantaged backgrounds in peripheral communities and is supported by the Hapoalim Bank, one of the largest and most influential financial institutions in Israel.

Entrepreneurship is in our DNA

At Cornell, the practical and the theoretical have always commanded equal respect. The University offers a remarkable array of programs focused on entrepreneurship, and its students, alumni, and faculty have played a role in developing a striking number of breakthrough technologies and companies.

Cornell is well known for its outstanding entrepreneurship programs, which span all of the schools and colleges in the University and engage nearly 10,000 students per year in entrepreneurship classes and events. Beyond the campus, the highly active Cornell Entrepreneurship Network (CEN) holds about 100 events per year for alumni and friends of the university in cities around the country. What is less well known about Cornell is that it has among the largest number of alumni entrepreneurs of any university in the country. Indeed, the level of entrepreneurial activity among Cornell alumni is comparable to that of MIT, a recognized leader whose impact was extensively studied in a February 2009 Kauffman Foundation report entitled "Entrepreneurial Impact."

A recent survey by the Cornell Survey Research Institute (SRI) contacted 140,983 alumni for whom Cornell has a valid email address. The 14,821 respondents (approximately 11%) reported founding a total of 9,266 companies, or an average of 1.97 companies per entrepreneur. To put these numbers in context, the MIT survey that is the basis of the Kauffman study identified 2,067 MIT alumni who founded a total of 4,279 companies, or an average of 2.07 per entrepreneur (Table 5 in the Kauffman report), out of a total of 105,928 MIT alumni surveyed. Thus, based on these large-scale surveys of alumni at the two institutions, the overall level of entrepreneurial activity is quite similar, with Cornell actually having a higher level in terms of the fraction of entrepreneurial alumni responding. It is important to remember that the total number of alumni companies for both institutions is quite a bit larger than what is identified in the surveys, because only a

New York City Companies Born at Cornell

Some of the companies founded or co-founded by our alumni or faculty

Moat
Noah ('97 A&S) and Jonah Goodhart '00
http://www.moat.com

Behance
Scott Belsky '02 ILR
http://www.behance.net

Magazine Radar
Todd Krizelman '96
http://www.magazineradar.com

JIBE
Joe Essenfeld '01
http://www.jibe.com

Postling
David Lifson '05
http://www.postling.com

Harvest
Danny Wen and Shawn Lui '00
http://www.getharvest.com

fraction of alumni responded. The Kauffman report estimates the total MIT impact as being several fold higher than the identified companies. For the Cornell data, SRI uses a more conservative estimation technique based on differential response rates among different subpopulations in the sample, which yields a multiplier of about 1.6—and an estimate of the total number of Cornell alumni companies of 15,280. A copy of the SRI survey appears in the Appendix.

While these surveys indicate that the overall level of entrepreneurial activity of Cornell and MIT alumni is comparable, a key difference is where alumni of the two institutions start their companies. At MIT about a quarter of alumni companies are in the Boston area, whereas at Cornell the alumni companies are scattered all over the country and the globe, because the economy of rural Ithaca can only absorb a small fraction of all this entrepreneurial activity. This makes Cornell much less visible as an entrepreneurial engine than schools (such as MIT) with a large concentration of activity, and also makes it more difficult to develop a virtuous cycle of close and mutually beneficial interactions between the university and its alumni-founded companies. There is thus tremendous opportunity to focus Cornell's entrepreneurship in the country's center of commerce, New York City.

The Technion is widely recognized as one of the leading entrepreneurial universities in the world. About a quarter of Technion graduates establish a new business during their careers, and over half these graduated from the engineering faculties which lie at the core of high-tech industry. According to a recent survey of Technion alumni, 17.7% of graduates responding to a survey are working or have worked in start-ups, three times their rate in the general economy in Israel. These students, again, come mainly from engineering fields.

Talent Retention

Cornell has long been a powerful force for innovation and economic opportunity in its hometown and surrounding region. Currently there are 86 Cornell-affiliated companies in the Ithaca area, 33 of which are in the Cornell Business and Technology Park. These companies were founded by Cornell alumni, faculty or staff, or use Cornell-licensed technology, and account for approximately 5% of the nonfarm employment in the region. Two of these companies have recently been acquired by global firms that have retained and even added to operations in Ithaca since the acquisition: Kionix was acquired by Rohm for approximately $233M in late 2009, and CBORD by Roper Industries for approximately $474M in early 2008. While these companies have a substantial impact on the local economy, the fact remains that a county of approximately a hundred thousand people has quite limited capacity to absorb the innovation and entrepreneurship generated by Cornell. Inevitably most of the economic impact is felt elsewhere in the country and in the world.

A number of programs and activities that have encouraged alumni, faculty, staff, and others to create companies in the local area. Since 1994, Cornell has invested more than $40 million in the Cayuga Venture Fund, which has a mandate to serve the economy of New York State, the Ithaca area in particular. The fund's portfolio companies have raised about $300 million; eight of the 11 firms in the most recent fund draw on intellectual property developed either at the university or with its support. The Cornell Center for Technology Enterprise and Commercialization (CCTEC) organizes and participates in dozens of events per year for potential inventors and entrepreneurs, including workshops on intellectual property, startup bootcamps, and entrepreneurship seminars. These are aimed at encouraging invention and entrepreneurship by faculty, staff and students, particularly in the local area. The

Over 7,000 Cornell graduates live in the Ithaca area, which is over 15% of the college educated population.

Kaltura
Shay David '07 PhD
http://corp.kaltura.com

Urban Interns
Cari Sommer '98
http://urbaninterns.com

Solvate
Mike Paolucci '92
http://solvate.com

City Pockets
Cheryl Yeoh '05
http://citypockets.com

Seamless Recipes
Keith Cowing '04, MBA '10
http://urbaninterns.com

GO TRY IT ON
Marissa Evans '06
http://gotryiton.com

MobileFuse
Ken Harlan MBA '04
http://mobilefuse.com

CrowdTwist
(inaugural NYC Tech Stars class)
Ken Harlan MBA '04 and
Josh Bowen '98
http://crowdtwist.com

University also operates a business and technology park in order to provide facilities for Cornell-affiliated companies.

Cornell alumni are a dominant force in the Ithaca area. There are over 7,000 alumni who live or work in Tompkins county, out of a total population of approximately 100,000 residents. While about 2,000 of these alumni work at the University, many are also the founders and key employees of local companies and hold leadership positions in community organizations and local government.

Technion is located in the third largest city in Israel, Haifa. In a recent survey, nearly half of Technion graduates reported living in Haifa, and the majority of the companies established by graduates are in the region, as are many of the larger companies where graduates work. Many of the world's largest technology companies, including Intel, IBM, HP, GE, Google, Yahoo and Qualcomm, have offices in Haifa, as a result of acquisitions of startup companies as well as the ability to work with Technion faculty, staff, students, and graduates, many of whom stay in the area.

Company Formation
Following the pattern of most universities, the vast majority of Cornell-affiliated companies were formed by alumni, in large part because there are so many more alumni than faculty. The university's practices emphasize alumni entrepreneurship, although some alumni-founded companies do license technology from Cornell. Most faculty companies, on the other hand, involve university intellectual property and licensing, making technology transfer practices particularly important in those cases.

Approach to General Entrepreneurship
Cornell's approach to entrepreneurship spans the entire university and every aspect of the entrepreneurial process, from technology development, to product innovation, to customer engagement, to early stage funding to growth capital. One of the hallmarks of Cornell's approach to entrepreneurship is not only the large number of alumni-founded companies but also the extremely active engagement of alumni in early stage investing activities – both seed funding and venture capital. As noted above a recent survey identified 4,696 alumni entrepreneurs who have established 9,266

companies. This same survey also identified 1,639 alumni who have been angel investors in 5,000 companies, and 723 alumni who have been venture investors in 3879 companies. Cornell also maintains a directory of over 180 alumni venture capitalists which includes a number of the largest names in the business.

The center of the culture of entrepreneurship at Cornell is called just that: Entrepreneurship@ Cornell. E@C, as it's known, is the clearinghouse for all things entrepreneurial at the University. There are a host of activities under this umbrella, many of which we summarize here.

Among its many wide-ranging activities, E@C publishes **Cornell Eship Magazine,** highlighting entrepreneurial activity across the University's campuses and Colleges. E@C supports social entrepreneurship activities on all campuses, hosting regular "Meet Ups" where students can network and hatch plans. E@C is also responsible for the Cornell Entrepreneur in Residence program and for the funding that supports eLab, a student business incubator. The annual two-day E@C conference typically attracts more than 1,000 entrepreneurially-minded students, faculty, staff, alumni, and business leaders.

In keeping with its broad charter, E@C serves Cornell's faculty as well as its students. A group of 72 faculty members, representing the full range of colleges and schools, meets monthly to share information and best practices.

The Entrepreneurship and Innovation Institute of the Johnson Graduate School of Management is the umbrella for all of that school's relevant programs and research. Working in conjunction with E@C, the Institute provides resources to students, faculty and staff including Virtual Venture Capitalists in Residence, Virtual Entrepreneurs in Residence and other networking opportunities. Most notably, it also provides the Big Red Startup Suite of services. The Big Red Suite consists of BR Legal, BR Consulting, BR Ventures, and BR MicroCapital. The first of these four resources connects Cornell Law students and outside firms directly with startups in need of counsel. More than 20 active mentoring firms have served 215 client companies to date. BR Consulting involves MBA students in startup projects. More than 40 Johnson students are typically involved with BR Consulting per year, completing 12–15 projects. BR Ventures is a

Entrepreneurship@Cornell (E@C)

How does Cornell cultivate entrepreneurship? Here are some of the ways.

Student Agencies, Inc. The nation's oldest student-run corporation (and the template for others) began as a laundry business in 1894. Today it's the second largest employer of students in the Ithaca area, after Cornell itself. Its seven constituent companies (engaged in everything from summer storage to campus marketing to business-plan development) generate $2 million in annual revenues, and pay out $200,000 to more than 200 undergraduate workers.

eLab. This student business incubator has worked with 26 concept teams, developing businesses such as DANI, which manufactures and markets wireless connected health devices and mobile applications offering real-time customizable nutrition information; and Wearever You Go, an online marketplace integrated within a niche social network for high-end leisure and business travelers, clothing retailers, and travel experts.

BR Ventures. Operated entirely by a team of MBA students at the S.C. Johnson Graduate School of Management, this early-stage investment fund has so far provided seed capital to 11 startups.

Langmuir Labs. Provides office, assembly, and wet-lab space for up to 40 companies. The rent they pay covers utilities, janitorial services, taxes, parking, shared conference rooms, copy facilities, a mailroom, and an employee lounge.

CornellBEST. Designed to connect students with technology incubators and investors, this offshoot of the Cornell Center for Technology Enterprise and Commercialization conducts (among other activities) workshops and "boot camps" on drug development, startups and technology management, patent- and grant-writing. CornellBEST also provides elite social networking opportunities for students interested in bio-pharmacy, nanomaterials, and angel investing.

CCTEC. The Cornell Center for Technology Enterprise & Commercialization (CCTEC) is Cornell University's technology transfer office. They manage technologies for Cornell University at the main campus in Ithaca, the Weill Cornell Medical College campus in New York City, and the New York State Agricultural Experiment Station in Geneva. Their goal is to support Cornell's land-grant mission and to promote public good by connecting Cornell technology to industry and business development efforts.

The Jung Hyun Oh Competition. A contest, sponsored by the College of Engineering, that challenges students to design or prototype an innovative technology based on advanced materials, demonstrating its commercial viability.

The McGovern Center for Venture Development. Offering state-of-the-art wet labs, offices, and conference facilities for six to 10 companies, this University-sponsored incubator aims to help life scientists optimize intellectual property and patent strategies, create new businesses and venture capital investments, and generate economic growth, while easing startup costs. Each fledgling company has two years to generate outside investment and move to an independent location.

Kessler Fellows. A year-long engineering-school program that places third-year students in startup companies. Among their recent destinations: MakerBot Industries in Brooklyn and Neverware in Manhattan, as well as the Palo Alto Research Center, MC10 in Cambridge, Mass., and Lumium Innovations in Gujarat, India.

BOOM (Bits On Our Minds). The Faculty of Computing and Information Science runs this annual showcase for undergraduate and Masters students seeking to exhibit their work and demonstrate their competence in digital technology and applications.

The Big Idea Competition. Provides a platform for undergraduates to tout and explain their business (or nonprofit) brainstorms, receiving feedback from a wide range of students and others.

The Cornell Business & Technology Park. A 300-acre suburban office and lab community located where the worlds of Cornell and the surrounding business community meet. The 80 companies currently located in the park employ more than 1,600 people.

CEN. The Cornell Entrepreneur Network (CEN) is the University's alumni business network. CEN produces top-shelf events on both coasts that feature world-class alumni speakers and unique opportunities to meet potential business contacts. Since June 2001, approximately 16,000 alumni, parents, students, staff and friends have attended hundreds of events. In 2006, attendance surpassed 4,000.

student-run venture capital firm that provides seed-stage investing for startups. To date, BR Ventures has made 11 investments and has had two successful exits. BR MicroCapital provides strategic consulting and micro lending services to underserved local entrepreneurs.

The Cornell School of Hotel Administration also has its own in-house institute. The Leland C. and Mary M. Pillsbury Institute for Hospitality Entrepreneurship focuses on hospitality startups by hosting a speaker series, sponsoring a business plan competition, and establishing its own entrepreneurs in residence.

Cornell's academic programs reinforce student entrepreneurship. There are more than 80 courses offered across the campus related to entrepreneurship, with an annual student enrollment in those courses of between 8,000 and 9,000.

Obviously, with that size of a curricular commitment to entrepreneurship, there are also a number of complementary extracurricular activities. The Entrepreneurship and Innovation Institute hosts a seminar series bringing entrepreneurs, technology innovators, and venture capitalists to campus to interact and network with students and faculty. Recent speakers have included Jeremy Kroll, CEO and co-founder of K2 Global Consulting, a global risk-consulting firm with offices in New York, London, Madrid, and Bahrain; and Gururaj "Desh" Deshpande, chairman of Sparta Group LLC, A123 Systems, Sycamore Networks, Tejas Networks, Sandstone Capital, and HiveFire, and co-chairman of the U.S. National Advisory Council on Innovation and Entrepreneurship.

The Cornell Center for Technology Enterprise and Commercialization (CCTEC), the university's technology transfer office, offers its own series of extracurricular activities. It partners with colleges within the university to hold free luncheons and dinners at all the campuses,

including those in New York City, to discuss intellectual property issues with faculty, staff and students. CCTEC hosts six yearly social events at the Ithaca campus for students to network with faculty, entrepreneurs and investors. Once a year, in conjunction with the Cornell Entrepreneur of the Year celebration, CCTEC holds a New Business & Emerging Technology Showcase, at which students and faculty can mingle with entrepreneurial alumni and innovators. Another annual CCTEC event is the Cornell Technology Venture Forum, held on Trustee/University Council Weekend, providing students and faculty an additional opportunity to network with trustees and alumni. Finally, CCTEC holds a biennial Technology Innovations Gala Reception honoring the recipient of the Ezra Technology Innovator Award and providing one more opportunity for networking.

Cornell doesn't just provide unstructured opportunities for students and faculty to potentially draw on the expertise of successful entrepreneurs and investors. It also has a series of formalized mentorship programs specifically connecting future entrepreneurs with current innovators.

Cornell hosts an Entrepreneur in Residence who spends time on campus working with students and faculty on refining their startup ideas.

eClips is a digital entrepreneurship resource for students, faculty, and even some outside parties. It's the world's largest repository of video clips related to entrepreneurship. More than 15,000 clips—covering 200 topics on business, leadership, and entrepreneurship—are available for download and viewing.

Along with all these informal and formal mentoring and networking programs and opportunities, Cornell incentivizes entrepreneurship with a set of contests and competitions. The Cornell Venture Challenge is a business plan competition sponsored by

Alumni Achievement
Irwin Jacobs '56
Former CEO, Qualcomm

A towering figure in the world of wireless, Irwin Jacobs helped develop and commercialize the technology known as CDMA, now used in 1.2 billion cell phones around the world. In his home city of San Diego, more than a hundred companies trace their roots back to LINKABIT, which Jacobs co-founded in 1969. A 1985 brainstorming session in his home office led to the formation of Qualcomm, Inc., which he led for 20 years. Jacobs received a BS degree in electrical engineering from Cornell in 1956.

BR Ventures. If any of the top three finishers develop their business plan, they receive a "matching" contribution from CCTEC. The Pillsbury Institute for Hospitality Entrepreneurship sponsors its own business plan competition. (For quick sketches of a number of other contests and mentoring initiatives, see "E@C" sidebar in this section.)

The College of Engineering is home to the Kessler Fellows program, which through a competitive selection process identifies 10-12 students who spend a year in an entrepreneurship program that gives them both classroom and practical experience. Students in this program attend a weekly entrepreneurship seminar that includes outside visitors and extensive opportunity for Q&A and discussion. Each student is responsible for researching and identifying a startup company where she/he then spends a summer internship with her/his stipend paid by the program. In a follow-up, students act as mentors to those in the program the next year.

Existing Real Estate or Incubators

To support entrepreneurship, Cornell provides facilities ranging from incubators to established business parks. To begin with, the University empowers the launching of startups by providing incubator programs and sites where students and faculty members can put their ideas and plans into action. Like all of Cornell's entrepreneurial efforts, its incubator programs have deep roots in the university's past.

In 1894 Seth Higby founded a student laundry business to help fund his Cornell education. When he graduated, he sold the business to a group of other undergraduates, who in turn sold it to other students upon their graduation. Over the years the company evolved from a for-profit business to a non-profit foundation providing experiential business learning opportunities for students. Today it's known as Student Agencies, and runs seven business generating $2 million in revenues, paying out $200,000 to the more than 200 undergraduates it employs. In 2008 Student Agencies joined with the E@C Program to form eLab, a non-profit providing business incubation and acceleration services to undergraduates. To date, eLab has worked with 26 concept teams that totaled 47 student entrepreneurs.

The tradition that began in the 1890s continues today in new incubation efforts such as the

Notable Cornell Tech Execs

Amazon – **Werner Vogels, CTO**

Applied Materials – **Jim Morgan '60, Founder and Chairman Emeritus**

Autodesk – **Carl Bass '78, CEO**

Cisco – **Padmasree Warrior '84 MS, CTO**

Intel – **Justin Rattner '71, '72 MSN, CTO**

Microsoft – **Steven Sinofsky '87, President Windows Division**

Qualcomm – **Irwin Jacobs '56, Former Chairman**

Sprint Nextel – **Dan Hesse '77 MBA, CEO**

Tata Group – **Ratan Tata '59, Chairman**

Verizon – **Lowell McAdam '76, President and CEO**

Xerox – **Sophie Vandebroek '90 PhD, CTO**

Notable Cornell Early Stage Tech Investors

Accretive – **Michael Cline '81 managing partner**

Battery Ventures – **Neeraj Agrawal '94 partner**

Canaan Partners – **John Balen '82 general partner, Eric Young '78 general partner**

Charles River Ventures – **Bruce Sachs '81 partner Michael Zak '75 partner**

First Round Capital – **Howard Morgan '68 partner**

Founder Collective – **Micah Rosenbloom '98 founder partner Bill Trenchard '97 founder partner**

Matrix Partners – **Paul Ferri '59 founding partner Stan Reiss '93 general partner Andrew Verhalen '78 general parther**

Mohr Davidow Ventures – **David Feinleib '96 parter**

Sequoia Capital – **Michael Goguen '86 managing partner, Doug Leone '79 general partner**

Y-Combinator – **Paul Graham '86, partner**

Neeraj Agrawal, Michael Cline, Doug Leone and Bruce Sachs were all named to the 2011 Forbes Midas List of top venture investors.

Capital Raised by Cornell Founders
(From limited sample only)

	Past Five Years (in $Millions)			Past Year (in $Millions)		
	Total	Early Stage	Grants	Total	Early Stage	Grants
Total	10,631	5,434	363	3,010	1,359	74
Alumni	10,518	5,370	318	2,988	1,347	65
Faculty	113	64	45	22	12	9
Bio-Science	1,831	1,288	144	848	500	45
Non-Bio-Science	8,800	4,146	219	2,162	859	29

Capital Raised by Cornell Founders
(Estimated)

	Past Five Years (in $Millions)			Past Year (in $Millions)		
	Total	Early Stage	Grants	Total	Early Stage	Grants
Total	16,805	8,350	507	5,140	2,177	119
Alumni	16,613	8,251	425	5,115	2,164	109
Faculty	192	99	82	25	13	10
Bio-Science	3,012	2,004	221	1,625	899	79
Non-Bio-Science	13,793	6,346	286	3,515	1,278	40

Kevin M. McGovern Family Center for Venture Development in Life Sciences. The center provides a state-of-the-art home for six to 10 startup companies; each has two years to generate outside investment and move into an independent location.

The Cornell Business and Technology Park (CBTP) is a 300 acre development comprising 24 buildings with about a million SF of office, research and development space including wet labs and clean rooms. It is home to approximately 80 companies, 60% of which are technology companies. The technology park was established in 1951 with significant growth since the mid 1980's. Currently, 33 of the 80 companies in CBTP are licensing technology from Cornell.

Venture Funding Obtained by Faculty, Students, Others

Cornell recently completed a survey of alumni and faculty, regarding their recent activities as business founders. This survey identified 9,730 companies founded by alumni and faculty, and 2,612 companies since 2006. These 2,612 companies received a total of $10.63B of funding in 2006–2010 of which $5.43B was early stage investment, or an average of about $4M per company, and just over half was early stage capital. About 20% of the overall capital raised and 33% of the venture capital was at bio-sciences firms. The total amount of venture investment in the entire country over this time period was approximately $120B, according to the PWC MoneyTree survey, so the activity of these Cornell affiliated companies represents nearly 5% of all such capital invested during that time period. These companies also had approximately 34,000 employees.

In 2010, these Cornell-affiliated companies raised $3.01B in funding of which $1.36B was early stage investment. While the early stage portion is a smaller percentage over the past year than over the 5 year timeframe, this is due to national changes in the amount of venture investing. In 2010 total venture investments were about $21B according to PWC MoneyTree, so the investment in these companies represents about 6.5% of that total.

In addition to surveying alumni and faculty about their activities as founders and co-founders of companies, we also asked about activities as early stage investors (over their

career so far, not just in the past 5 years). This inquiry identified angel or seed stage investments in 5,139 companies, 211 of which have been acquired for at least $100M and 157 of which went public. The survey also identified venture investments in 3,940 companies, 313 of which have been acquired for at least $100M and 199 of which went public.

Because this data is based on the limited sample of companies respondents, the overall impact of Cornell alumni and faculty is considerably higher. A conservative estimate of the overall impact based on differences in response rates among subpopulations yields a multiplier of 1.6. These estimates are reported in the tables along with the raw data.

By any measure, Cornell faculty and alumni have been enormously active in raising funds for new companies and in creating new jobs over the past five years. A New York City campus that led to a quarter or more of such activity occurring in the city, matching the experience of MIT in the Boston area, would add billions of dollars and tens of thousands of jobs to the city's economy.

Cornell Entrepreneurial Activity

Alumni and faculty are active founders, angels and venture investors

Companies Created
(From limited sample only)

Angel Investors	Total	Alumni	Faculty
Total	5,139	5,000	139
Acquired for > $100 M	211	202	9
Went Public	139	9	2

Venture Investments	Total	Alumni	Faculty
Total	3,940	3,879	61
Acquired for > $100 M	313	308	192
Went Public	61	5	7

Companies Founded	Total	Alumni	Faculty
Total	9,730	9,266	464

Companies Created
(Estimated)

Angel Investors	Total	Alumni	Faculty
Total	8,406	8,230	176
Acquired for > $100 M	329	318	11
Went Public	273	271	2

Venture Investments	Total	Alumni	Faculty
Total	6,256	6,185	71
Acquired for > $100 M	523	517	6
Went Public	318	311	7

Companies Founded	Total	Alumni	Faculty
Total	15,944	15,280	664

Three Successful Local Ithaca Startups

INCODEMA

INCODEMA Inc. manufactures accurate, detailed sheet metal prototypes and small production runs extremely rapidly using computer-aided stamping technology. The company's CNC precision workstation, in combination with state-of-the-art CAD software, makes expensive and time-consuming tooling unnecessary. Miniature components are a specialty. INCODEMA also offers mechanical CAD and design services. INCODEMA can produce prototypes in a wide range of materials, from carbon steel to plastics, incorporating operations such as contouring, embossing, and riveting.

Cornell Connection: INCODEMA has completed several projects for the Laboratory of Elementary-Particle Physics (LEPP) and has various other projects in process, which will be used to further develop the synchrotron operations at Cornell. INCODEMA has also worked extensively with the College of Engineering, the Center for Plasma Studies, and Cornell Local Roads Program. This includes similar collaboration with other Cornell projects.

Advion BioSciences

Advion provides bioanalytical services and microfluidic chemistry systems to pharmaceutical and biotechnology companies. Co-founded in 1993 by a member (at the time) of the analytical texicology faculty at Cornell's College of Veterinary Medicine, and based on technology developed at his lab, Advion remains in Ithaca, now with a network of sales and support offices scattered across Europe, Japan, and North America.

Cornell Connection: Advion was co-founded by a member of the Cornell faculty of analytical toxicology in the College of Veterinary Medicine, based on the technology developed at the lab of Dr. Jack Henion, a leading researcher in the field of Liquid Chromatography/Mass Spectrometry. Henion is a Professor Emeritus at Cornell and is co-founder and Chairman of Advion.

CBORD Group, Inc.

The CBORD Group Inc. is a worldwide provider of food service and nutrition services, software, and systems for campuswide ID card programs, housing management, and cashless dining. Founded in 1975, CBORD is the dominant provider of cashless systems to the college, business, and healthcare markets, with more than 750 installed cashless systems and over 100 campus housing systems under current management. CBORD develops, markets, sells, installs, and supports its base of more than 6,000 clients from its headquarters in Ithaca. CBORD hosts an annual user group conference attracting more than 600 participants annually.

Cornell Connection: The company's founder is an alumnus of Cornell's College of Arts and Sciences and the Johnson Graduate School of Management. The CBORD Group grew out of a set of programs designed by the company's founder while a graduate student working in Cornell Dining. The company is headquartered in Ithaca and has 450 employees worldwide, with 250 located in Ithaca.

Company Formation: Technology Transfer

The Cornell Center for Technology Enterprise and Commercialization (CCTEC) promotes beneficial interactions between Cornell and industry. CCTEC's mission is firmly rooted in Cornell's role as New York State's sole land-grant institution and its obligation to use Cornell-generated research to improve the lives of the state's residents. Today this responsibility extends to the entire world. CCTEC was created in 2004 to refocus Cornell's technology licensing efforts on promoting commercialization and encouraging entrepreneurship based on the university's intellectual property. Over the past few years CCTEC has made enormous strides in moving Cornell into the top ranks in technology licensing. For instance, in the 2009-10 academic year 12 startups were founded using Cornell licensed technology, and in this most recent 2010-11 academic year another 10 were founded. This places CCTEC firmly in the top tier of university technology licensing offices in terms of startups created in the past two years, according to recent surveys by the national Association of University Technology Managers (AUTM).

CCTEC manages Cornell technologies for Cornell's main campus in Ithaca, for the Weill Cornell Medical College in New York City, and for the New York State Agricultural Experiment Station in Geneva, N.Y. CCTEC works with companies to develop innovative technologies into products and services that serve the public good, creating new businesses and fueling regional economic growth. CCTEC currently has offices in Ithaca and at the Weill Cornell Medical College in New York City.

Current Technology Transfer Process
Tech Transfer Staff: CCTEC's staff of 31 includes a vice provost/executive director, 11 licensing officers, three licensing assistants, two outreach and economic development professionals (a third position is currently vacant), three intellectual property service professionals, and ten administrative staff. Collectively, they hold nine PhD degrees (all in hard-core sciences), 11 Master's (MS or MBA) degrees, and 27 undergraduate (BS, BA, or associate) degrees. We also have four certified licensing professionals with active certifications and two certified public accountants with previous certifications.

Annual operating budget for the technology transfer program: FY10: $11M

Institutional policy on license revenues versus equity: Cornell accepts equity positions in lieu of cash for licenses to small or new businesses that are underfunded in order to encourage their participation in CCTEC. Many of the licenses granted to startup companies carry no cash up-front requirements at all and back-load all cash considerations. Depending on the situation, CCTEC, on behalf of Cornell, will accept stock and warrants as well as interest-bearing promissory notes convertible to equity if such an arrangement best serves both parties' interests.

As of the close of FY11 (June 30, 2011), CCTEC held, on behalf of Cornell, equity in 29 companies that have licensed Cornell technologies. These equity positions total more than 6.5M shares. Their current value cannot be ascertained, since 28 of our holdings are in private equity. One holding, Pacific Biosciences – SMRT – recently went public; Cornell's stake emerged from the mandatory Securities and Exchange Commission "lock up" period with a current market value of approximately $875K. Eleven of the over-all 29 holdings involve New York State companies, and 14 involve non-bio technologies. A detailed listing of our current equity holdings is provided electronically.

CCTEC also holds interest-bearing promissory notes convertible to equity, with a cumulative principal amount exceeding $2.6M, in 16 companies. Ten of these 16 are New York State companies, and eight are companies working on non-bio technologies. The interest rates of these notes generally are a few points below the common consumer loan interest rate, despite the risk associated with such an unsecured debt instrument. A listing of the notes currently held by CCTEC on behalf of Cornell is provided electronically.

Details of recent funding obtained by faculty, students, and others: A recent survey elicited responses from 29 of 35 new businesses founded with licensed Cornell technology in the past 5 years. Twenty-five of the 29 respondents reported a total of $79M (average $2.7M) in early-stage funding received over that period, with $34.8M (average $1.2M) in the last year alone.

- $31.8M (average $1.1M) of the 5-year total was in the form of contracts and grants from funding agencies, with $24.5M (average $0.8M) in the last year.

- $2.4M (average $81.6K) of the 5-year total came from other "non-equity dilution" sources such as loans, business plan competition awards, and sales.

- $0.6M (average $20.6K) of the 5-year total was from last year.

Impact of Technology Transfer on the Tenure Process: Cornell awards tenure based on a candidate's research and teaching. In engineering and applied science fields, research impact is increasingly viewed not just as an academic matter, but also in terms of demonstrated commercial value. While traditionally commercial value was left to be demonstrated by others, many faculty today are motivated to prove the broader value of their work more directly. Thus we see a shift, not only at Cornell but also nationally, towards tenure evaluations that give serious weight to the commercial activities of faculty members and their students. Tenure criteria at Cornell and most universities of similar caliber are set individually by each department, subject to review by the administration at the level of the deans and the provost (and ultimately the board of trustees). The administration is very supportive of research commercial impact as a measure of quality, and a number of positive tenure cases at Cornell have made substantial reference to such activities.

Technology Best Practices

CCTEC's technology transfer process is based on the simple concept of "doing what is best for the technology and, to the extent possible, leveraging the technology to help promote regional economic vitality." This approach reflects our organizational mandate and goals.

Monthly surveys are sent out to Cornell inventors and licensees, and the results are summarized and made available to members of the university-wide Cornell Technology Transfer Advisory Committee (TTAC) via a password-protected website (see www.cctec.cornell.edu/about/advisoryboard.php).

TTAC is comprised of the university's senior leadership. Its five standing subcommittees continuously monitor the fitness of Cornell's policies and guidelines; provide oversight to CCTEC's operations; develop processes to facilitate the transfer and exchange of tangible research materials; mediate to resolve disputes; and provide oversight and advice on CCTEC's equity and debt holdings.

As an important component of its land grant mission, beneficial use by the public of knowledge that results from academic activities at Cornell is actively promoted and encouraged by the University. Knowledge that does not require intellectual property protection to incentivize development and use is freely disseminated to potential users. An illustrative example of such knowledge-sharing is the Cornell AquaClara Project. See <https://confluence.cornell.edu/display/AGUACLARA/Home>. For knowledge that requires intellectual property protection to incentivize development, Cornell generously invests its resources to seek such protection and to seek industrial partners for its development. Intellectual property protection and industry partnerships are the responsibilities of Cornell's Technology Transfer Program, implemented by the Cornell Center for Technology Enterprise & Commercialization.

Recent Technology Transfer Record

In FY11, Cornell had its best year ever from a technology transfer standpoint. CCTEC received an all-time high of 367 disclosures. This was the third year in a row that it received more than 300 disclosures. The average over the past five years was 311. This growth reflected CCTEC's success in outreach and education efforts at Cornell.

Other record numbers in FY11: CCTEC executed 606 agreements, bringing its five-year average to 495. It granted 162 commercial licenses; the average number of licenses was 90.6. It received 79 U.S. patents; there, the average was 68.4. And it earned $67.2 million in revenues; average revenues were $24.7 million.

It should be pointed out that 154 of the 162 commercial licenses granted by CCTEC in

FY11 went to companies in the United States. This accomplishment was realized despite the struggling U.S. economy. Of the 154 U.S. licenses, 72 went to companies in the State of New York, including 44 companies in a western region with 12 counties designated by the United States Immigration and Naturalization Service as EB5 immigration visa-eligible because of their high unemployment rates. Twenty licenses went to companies in the "downstate" region that includes New York City and its northern suburbs.

Cornell also grants "free" licenses for various reasons, but they are not included in the "commercial" license data. Commercial licenses are those from which we receive or expect to receive financial consideration.

Statistical Snapshot of the Tech Transfer Process

		Past year	5 Year Average
Number of licenses granted	Bio-Science	83	27.7
	Non Bio-Science	79	63
Amount of licensing revenue generated	Bio-Science	$10,500,000	$9,300,000
	Non Bio-Science	$63,100,000	$24,700,000
Number of patents obtained	Bio-Science	112	98.6
	Non Bio-Science	55	71.8
Number of spin-off companies created	Bio-Science	6	3.6
	Non Bio-Science	4	3.4
Average number of employees working at spin-offs founded in the last 5 years	Bio-Science	1	1
	Non Bio-Science	2	5
Number of spin-offs that stay in a 20-mile radius of the campus (es)	Bio-Science	3	2.2
	Non Bio-Science	2	2.6

Size of company (Number of employees)	Past year		5 Year Average	
	Number of licenses granted	Amount of licensing revenue granted	Number of licenses granted	Amount of licensing revenue granted
1–499	148	2,000,000	77.4	1,000,000
500+	14	58,500,000	14.2	15,700,000

Successful Cornell Tech Transfer Startups

Three companies that were created through Cornell University's technology transfer office, and remained near our Ithaca campus:

Kionix

Consumer-electronics leaders worldwide utilize Kionix's products, development tools, and application support to enable motion-based gaming; user-interface functionality in mobile handsets, personal navigation devices, and TV remote controllers; and hard-disk-drive drop protection in mobile products. Kionix's products are further diversified into the automotive, industrial, and healthcare sectors. Its world-class 68,000 SF office and manufacturing facilities enable Kionix to meet the needs of high-volume, high-yield MEMS manufacturing.

Kionix was originally named TMS Technologies. It obtained its first license from Cornell in 1994. In the early 2000s, TMS sold its optic network business to Calient Technologies, changing its name to Kionix as it began to focus on the development of accelerometers using licensed Cornell technologies. To strengthen its accelerometer products, Cornell granted Kionix additional technology licenses in 2003. In 2009, Kionix was acquired by a Japanese corporation, ROHM, Ltd. for $235M. Rohm has kept the company's headquarters in Ithaca.

Cornell Connection: Kionix's motion sensors are based on more than 30 Cornell technologies to which Kionix has exclusive license. The company's founders received their doctoral degrees from the College of Engineering; in addition, several senior employees are Cornell graduates. Gregory Galvin, Kionix's president and CEO, recently began a four-year term on Cornell's Board of Trustees.

Kionix
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Ithaca, NY 14850
http://www.kionix.com/index.html
Gregory J. Galvin Ph.D., President and CEO
607-257-1080
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BinOptics

A manufacturer of monolithically integrated optoelectronic components based on indium phosphide and other semiconductor materials, BinOptics' current product line includes edge-emitting and surface-emitting Fabry Perot lasers, DFB lasers, and lasers with integrated monitoring photodiodes that provide transceiver and transponder manufacturers with unprecedented price-performance advantages. BinOptics also provides custom-integrated microphotonic solutions for optical systems and subsystems; in the process, it helps its business customers achieve substantial cost, footprint, and power reductions by replacing several discrete components with a single integrated chip. BinOptics' patented laser structures and manufacturing processes are unique and enable a high level of functional integration and unparalleled device performance as well as reduced cost. Its technology platform shortens customers' "time to market" for low- through high-volume products. The resulting cost

reductions and shorter design cycles enable customers to gain a competitive advantage in emerging markets such as: Fiber To The Home, 10G Ethernet, CWDM, High-Density Optical Data Storage, and Telecom/Datacom.

Cornell Connection: BinOptics was founded in 2000 using technologies developed at Cornell. Dr. Behfar, the co-founder and CEO, holds M.S. and Ph.D. degrees from Cornell. The company has been in Ithaca since its founding. It has received funding from the Ithaca-based Cayuga Venture Fund, which focuses on high-tech start-ups in Ithaca and upstate New York.

Bin Optics
9 Brown Rd
Ithaca, NY 14850
http://www.binoptics.com/index.html
Alex Behfar Ph.D., Co-founder/CEO
607-257-3200

e2e Materials

E2e is a clean-technology startup whose petroleum-free, biodegradable composites are stronger, lighter, and cheaper than the composites filling America's landfills today. Its composite material platform can be tuned to strength properties that reach the level of midrange steels, delivering tremendous strength-to-weight ratios. E2e's materials are fully biodegradable; they're made from annually renewable resources including soy proteins and such natural fibers as bamboo, jute, flax, and kenaf. The company's products use one-third of the energy required for the

average wood-based product, reducing the carbon footprint of e2e's facilities. Lighter products also require less energy to ship, handle, and install.

Cornell Connection: e2e Materials' products are based on a technology developed by company co-founder Anil Netravali, a professor of fiber science and apparel design at Cornell's College of Human Ecology. The company's other co-founder, president and CEO Patrick Govang, is a former director of the Cornell Center for Materials Research, where his effective technology transfer programs played a role in licensing agreements with six start-up companies that collectively raised more than $35M in growth capital. e2e Materials has received financial backing from the Cayuga Venture Fund. One of the company's directors, Zachary Shulman, is a managing partner of CVF, teaches at Cornell's Samuel Curtis Johnson Graduate School of Management, and holds JD and BS degrees from Cornell.

 e2e Materials
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Patrick Govang, Chairman, President, and CEO
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Technology Transfer Process (Technion)

The Technion's mission in technology transfer is to promote the advancement of innovations from the laboratory to the marketplace, through transfer of research rights to for-profit entities that will develop and commercialize inventions. The public obtains a return on its investment in the form of improved and innovative products and services and stimulation of the economy. The Technion is credited as the source of the invention, and can benefit financially, both by obtaining fees and royalties and by securing industry research sponsorship. Faculty and staff benefit from the challenge of translating ideas and discoveries into practical therapies and products, and from industry collaborations that provide them with access to unique research technologies and materials. Institutions require effective technology transfer operations in order to compete for the best faculty because of the research funding as well as personal income that can be obtained from their inventiveness.

Current Technology Transfer Process

Tech Transfer Staff
The Technion technology transfer office currently consists of 18 people: a manager who has an investment banking and legal background; 11 business development professionals including a director in each of four areas (i) physical sciences, (ii) IT and engineering, (iii) life science and medical, and (iv) life sciences and clean tech, and 7 licensing liaisons; 3 general administrative staff; and 3 patent administrative staff.

Technion R&D Foundation Ltd. (TRDF)

Technology Transfer Office Statement of Operating	
(USD Thousands) 1.1–31.12.2010	
Income	
Income from commercializing patents	$13,599
Cost of Income	
Patents	$ 2,093
Salary and related expenses	714
Professional Legal Services	453
Office expenses	52
Marketing expenses	26
Conferences & Seminars	28
Other expenses	43
	$3409
Net Income	$10190

License Revenue vs Equity

The Technion has always taken pride in its adaptability and in its ability to re-invent itself. This is also true concerning the nature of the dialogue and interaction the Institute conducts with the business community at large. Technion leaders have long realized that in order for the Technion to maintain a robust and meaningful dialogue with the industrial and business community that surrounds it, and in order to maintain its leadership and relevancy not only in science and teaching but also in commercialization, it must be flexible and it must adapt its commercialization policies and practices to changing market conditions. Therefore, our commercialization policy is always evolving, dynamic, and adjustable to the specific circumstances and we concentrate our efforts not merely on maximizing the commercial returns to the university but also on finding the appropriate partner who is able to summon the resources, vision, stamina and expertise that are required to effectively commercialize the fruits of cutting-edge research.

As is the case in most technology-driven universities, many of Technion's technologies are better suited to be commercialized by an established company. However, it has been our experience that spinning off these technologies to stand-alone independent commercial entities often increases their chance to eventually be commercialized/licensed to an established corporation. Hence, the Technion has built expertise in out-licensing technologies to fledgling startup companies and up-and-coming entrepreneurs who can demonstrate the kind of skill and determination that are so necessary in order for them to be able to withstand the trials and tribulations that are an integral part of any new venture.

As far as the commercial terms and the deal structure are concerned, we normally opt for a broad, yet modest base of compensation that combines some equity (normally <15%) and royalties (normally <5%). This down-to-earth approach stems from the realization that for every dollar that has been invested by us in the science itself, a significant additional investment will be required before a product is made and reaches the market. We estimate this at a 1:10 ratio.

Despite some disadvantages, it is our experience that equity provides certain benefits that cannot be overlooked or underestimated. The main commercial benefit stems from the fact that there is not always a correlation between the value/effectiveness of equity and the value/effectiveness of royalties, and equity can increase significantly in value well before any revenues are generated. Other benefits associated with equity include:

• A level of flexibility in structuring deals which increases the number of deals that can be made.

• "Insurance" in case the original technology upon which the company was formed is abandoned (in whole or in part). This eventuality is not unusual in the fast-paced world of high technology in which an original idea licensed to a startup may serve as a "triggering device" and be quickly eclipsed by a superior one.

• Improved ability to monitor the progress the company is making and steer its way in the commercial world.

• Alignment of interests with investors, entrepreneurs, faculty.

• Economic Development on the local and national levels.

• Faculty retention.

Our strict internal policies, bylaws, and decision making processes safeguard us from some of the dangers and pitfalls that are often associated with such an equity–driven commercialization policy (e.g., legal exposure, conflict of commitment by faculty, danger of compromising scientific integrity, etc.).

Best Practices related to the Technion's Technology Transfer Process

Entrepreneur in Residence Program

The Technion runs a unique Entrepreneur in Residence Program (EIR). High-profile entrepreneurs with proven track records in new venture creation are recruited and given an option, upon meeting prescribed benchmarks, to license certain technology. These milestones normally include the raising of a minimal amount of equity ($100K-$500K) and the presentation of a bullet-proof business plan.

As part of its efforts to attract the best, brightest, and most capable entrepreneurs, the Technion is leveraging its vast network among VC's, incubators, head-hunting firms and service providers.

Finders
As part of its business development endeavors, the Technion liaises with experienced professionals from various industries, and different geographical areas, to expose the advances in Technion technologies to potential partners. The aim of the program is to leverage the finders' expertise and networks.

AMIT
The Technion is the first university outside of the U.S. selected by Alfred Mann to be a part of his network of Alfred Mann Institutes (AMIs) at the world's top research institutions.

Mann has established the Alfred Mann Institute at the Technion (AMIT) with an endowment exceeding $100M. The purpose of AMIT is to develop and commercialize biomedical inventions conceived by Technion researchers. AMIT is described in detail in a separate section.

Mentorship Program
There is much potential in exposing academic research to application-oriented business people.

Through the Mentorship Program we engage experienced, technology–oriented serial entrepreneurs as mentors to Technion researchers. These mentors harness their experience, networks, and understanding of a particular industry and provide precious insights as to the preferred commercialization route or application (which is critical especially in cases where platforms or broad-based technologies are involved). These individuals are instrumental in other ancillary processes such as capital raising, market validation, etc. It is important to note that the Mentorship Program differs from the EIR program in that the mentor is often engaged as a paid consul-

Results of Current Technology Transfer Process

		Past year	5 Year Average
Number of licenses granted	Bio-Science	8	6
	Non Bio-Science	15	14
Amount of licensing revenue generated	Bio-Science	$12,725,000	$7,903,000
	Non Bio-Science	$237,000	$123,000
Number of patents obtained	Bio-Science	25	16
	Non Bio-Science	22	15
Number of spin-off companies created	Bio-Science	3	3
	Non Bio-Science	2	3
Average number of employees working at spin-offs 1 2 3	Bio-Science	18	18
	Non Bio-Science	9	9
Number of spin-offs that stay in a 20 mile radius of the campus (es)	Bio-Science	15	15
	Non Bio-Science	13	13

1. Based on estimated data of employees of active spin-offs in year 2011.

2. Average number of employees working at spin-offs was calculated excluding Sleepmed Inc. with over 900 employees.

3. 5 Year average number of employees working at spin-offs was calculated as average number of employees working at spinoffs in each of the years 2006 - 2010.

	Past year		5 Year Average	
Size of company (Number of employees)	Number of licenses granted	Amount of licensing revenue granted	Number of licenses granted	Amount of licensing revenue granted
1-50	10	$172,000	11	$823,000
51-250	2	$66,000	3	$41,000
251-1000	1	$13,000	1	$17,000
1000+	8	$12,711,000	5	$7,171,000

Three Successful Startups Near the Technion

Elbit Systems

This company is far from being a startup, but it was a startup when launched by Technion physicist Uziah Galil in 1967/8, as "Elron", to produce electronic parts, after France levied an embargo on exports of defense-related products to Israel. Headquartered in Haifa's Science Park, Elbit is Israel's sixth largest industrial exporter and employs over 11,000 workers. It can be said that Elbit was Israel's first true startup success, serving as a role model for generations of entrepreneurs.

InSightec

InSightec was founded in 1999 when GE Healthcare (then GE Medical Systems) and Elbit Medical Imaging transferred their proprietary technology to the company. InSightec's technology, protected by over 30 patents, dissolved tumors (fibroids and even brain tumors) with precise ultrasound energy beams guided by MRI (magnetic resonance imaging). InSightec has invested over $100 million in research and development. The company holds over 30 patents with additional intellectual property pending. InSightec employs some 160 employees, in Tirat HaCarmel (a southern suburb of Haifa) and in Dallas, Texas.

GE Ultrasound (now part of GE Healthcare)

This company began its life as Diasonics, a startup co-founded by Technion EE graduate and Elscint veteran Alex Silberklang. It was acquired by GE Medical in 1998. Silberklang, in a legendary journey, flew to Milwaukee to persuade the head of GE Medical to allow his team to develop an ultrasound cardiology imaging device based on the PC, a technology GE had already investigated and rejected. Silberklang today serves as Chief Technology Officer for GE Medical. GE Ultrasound has become a market leader in relatively low-cost ultrasound cardiology imaging, now based on laptops. The company is located in Tirat HaCarmel, with some its production is done there, and some at a site in southern Israel. Its senior management team is comprised largely of Technion graduates.

tant who supports the researcher and/or business development officers in their commercialization efforts, helping them devise strategies both for the creation of new ventures and for straightforward out-licensing to incumbent market players. At any given time the mentor focuses on a rather limited number of technologies (normally <5).

Technion Incubator – Technion Seed
A unique partnership between four leading international VC funds and the Technion, Technion Seed provides a home for entrepreneurs' and researchers' revolutionary technology ideas where those ideas can be transformed into successful global companies. Technion Seed, which is currently in a transition stage, is described in detail in separate section.

Technion Investment Opportunities Fund
The Technion also has an internal $10M fund called the Technion Investment Opportunities Fund. The fund invests in syndication with other investors and is aimed at preserving the equity stake in Technion-related companies and encouraging the growth of Technion-originated technologies.

Internal Applicable Research Funds
One of the biggest challenges that technology transfer presents is the gap between early research products, innovative as they may be, and the level of evidence that is required by the industry or investors to consider allocating resources to further the research. The Technion's internal applicable research funds are aimed at bridging this gap by taking promising projects to the next milestone, beyond the proof-of-concept stage.

Excellence Award for Technology Transfer Oriented Research
The Technion bestows an excellence award for research, inventions, developments, and publications initiated at the Technion which have revenue or profit potential for the inventors and the Technion. The goal of the award is to encourage applicable inventiveness and entrepreneurship in research. The researchers are rated on commercial applicability measures such as potential market share and technological maturity.

The Technion Network
The ATS (American Technion Society) and the other Technion societies around the world comprise an international network of thousands of dedicated and devoted members and supporters of the Technion. Many members of this large Technion community are prominent leaders in their respective fields/industries. T3 is continuously looking for mechanisms to harness, on a not-for-profit basis, this vast pool of expertise and knowledge for the benefit of the on-going commercialization efforts.

Webinars
The Technion has devised a well-established Webinar program aimed at presenting Technion technologies to a pre-selected audience of investors, industry leaders, entrepreneurs, corporate executives, in-licensing officers, and service providers. The purpose of this program is to increase the visibility of Technion technologies and assist in marketing and commercialization efforts.

Faculty Profile
Ken Birman

Safe and smart
Ken Birman has fond memories of a few weeks in the late 1990s when "it took a couple of random guys from Ithaca to boot up the New York Stock Exchange every morning."

Birman, Cornell's N. Rama Rao Professor of Computer Science, specializes in high-assurance distributed systems such as the one that ran most of the NYSE for nearly a decade. His work has also been used in French air traffic control and in managing U.S. Navy cruisers and destroyers.

These days, however, Birman's head is in the clouds – in cloud computing, where the combination of centralized storage and ubiquitous access spells huge benefits in productivity, and big hang-ups over reliability.

MBA - Global Patent Course
This program is the result of a combined effort by the Dingman Center for Entrepreneurship at the University of Maryland, T3 (the Technion Technology Transfer unit) and Technion's MBA program.

As part of this program MBA students, of which half are Israeli Technion students and half are American students (from Maryland University and Harvard) work collaboratively in preparing business plans aimed at commercializing patents and technologies developed by Technion researchers. The course is aimed at providing the students a hands-on experience in commercialization and starting a company involving a real-life innovation. At the end of the course the students present their business plans to a select group of seasoned venture capitalists and serial entrepreneurs.

Internal Technology Transfer Seminars
As part of its ongoing efforts to increase Technion researchers' level of openness to commercialization and to educate Technion faculty about different aspects related to commercialization, T3 conducts, on a regular basis, seminars and workshops tailored to Technion faculty and graduate students. These programs deal with various aspects of commercialization such as patenting, entrepreneurship, finance, fund raising, licensing, company formation, etc.

Social Media
As part of its on-going outreach efforts and to increase its visibility, the Technion is making use of a variety of social media tools that have become available in recent years, including LinkedIn, Wikipedia, Facebook, Twitter, YouTube and the T3 blog.

Professional Conferences
The T3 Team attends and presents on a regular basis national and international professional conferences related to commercialization, licensing and technology transfer. These conferences include the Israeli, European and US Biomed conferences, AUTM conference, Nano Technology conference, etc.

Every time a bank or brokerage advertises a breakthrough in convenience, "you open the newspaper and read about 25,000 people whose financial information was disclosed to someone in Russia," Birman says.

To help sensitive industries overcome cloud-phobia, Birman is working with Cisco to cut down on the glitches of online audio and video. More trustworthy routers, he says, will produce better results for less money. That would be a win-win for New York's media, health care, and finance companies – and for New Yorkers, who are some of the world's biggest consumers of wireless content.

Business Expansion and Attraction (Cornell)

The University views business expansion and attraction largely as an extension of the company formation process. Local companies founded by Cornell alumni (or with Cornell technology) grow through continued interaction with the university in research, technology development, and recruiting.

Cornell has extensive research and recruiting relationships with nearly all major national corporations, not just in the tech sphere but in virtually every line of business. In some cases, large corporations have purchased companies spun out from Cornell, keeping and even expanding their local operations. Rohm's acquisition of Kionix and Roper's acquisition of CBORD are two examples. Another such case involved Autodesk, which now has offices in Ithaca as a result of its 1993 acquisition of Ithaca Software; moreover, a founder of that company, Carl Bass, is Autodesk's current CEO.

Given the rural nature of the Ithaca community, however, it has not proven practical for many national corporations to locate facilities there, regardless of the strength of their ties to Cornell. That story will be very different in New York City.

Recruitment and General Outreach
Cornell encourages a variety of dynamic relationships with established businesses. Ties that start out with a narrow focus (on recruitment, for example) often develop into multifaceted, long-term, mutually beneficial partnerships. Companies gain access to the intellectual and physical energy of our students and the insights and cutting-edge research of our world-class faculty. Students get invaluable – and sometimes career-starting – experience. Teachers get the chance to build topical, real-world projects into their courses.

Such interactions can open up new pathways of research, sometimes leading to the development of breakthrough technologies. Many companies (see opposite page) have branched out or expanded as a result of their work with Cornell. More than a few (see following list) have eventually decided to move operations to the Ithaca area in order to be closer to the university.

The Office of Corporate and Foundation Relations is the front door for companies interested in recruitment, research, technology transfer, executive education, and other ties. Cornell Career Services (along with the career service offices of the various colleges and graduate and professional schools) also plays an important role by arranging internships, externships, and mentoring relationships, and by providing opportunities for students to shadow professionals on the job.

Students receive extensive support through career fairs and other career-related events, and through on-campus recruiting, alumni networks, tutorials and trainings, job searches, and career placement. A number of the testimonials submitted with this proposal pay tribute to the university's wide assortment of business programs and partnerships.

Training and Continuing Education
Many of our colleges and specialized research centers provide trainings, workshops, and courses tailored to particular companies' needs. Cornell's training and continuing education programs include:

Technology and Characterization at the NanoScale
This semi-annual course is one of a number of training workshops offered to business scientists by the Cornell NanoScale Facility. Recent workshops have focused on plasma processing, advanced lithography, materials characterization, and computational methods, among other subjects. The center's facilities and resources are available to scientists on an open basis.

Partnerships in Materials Research
The NSF-supported Cornell Center for Materials Research brings industry scientists together with Cornell scientists (110 faculty representing 12 departments and disciplines so far) to tackle technical issues, do joint research, or participate in symposia, short courses, or problem-solving semester-long projects, with matching funds from the NYS Foundation for Science, Technology, and Innovation.

Area Businesses that have Grown with Cornell's Help

Advanced Design Consulting USA

conceives and manufactures custom scientific equipment for commercial, academic, and government facilities in Europe, Australia, China, and the U.S. A 22-employee company located in Lansing, NY, ADC has been deeply involved in the National Synchrotron Light Source II, a $1 billion dollar project. For the past ten years, ADC has worked with Cornell faculty and staff and utilized Cornell facilities in connection with a number of projects. That collaboration "has been key to helping ADC land these contracts, resulting in solid engineering and manufacturing jobs in Upstate New York," says president and CEO Alexander Deyhim.

Company address
126 Ridge Road, Lansing, NY 14882

Contact
Alexander Deyhim, President & CEO

(607) 533–3531

Mezmeriz

uses patented MEMS technology developed at Cornell to produce a full-color video projector that is small and energy-efficient enough to be embedded into mobile phones and tablet computers. Mezmeriz hires Cornell graduate students, interns, and trailing spouses; regularly conducts project work with Cornell's business, engineering, and law schools; participates in entrepreneurial and technology events; and relies on prototyping and testing facilities on the Cornell campus. In 2006, Mezmeriz turned down an attractive funding opportunity to relocate to another state because of the strength of Cornell's entrepreneurial ecosystem - a decision that, according to founder and CEO Brad Treat, "has proven crucial to our ongoing success."

Company address
95 Brown Rd. #184, Ithaca, NY 14850-1294

Contact
Brad Treat, CEO

btreat@mezmeriz.com

(510) 295–8140

(607) 216–8140

Widetronix

was founded in 2003 by Michael Spencer, growing out of his research at the the Wide Bandgap Laboratory of the College of Engineering. With funding from the United States Navy, the company designs and builds tiny, low-power, self-charging batteries (capable of running for 25 years and up) for medical implants and other critical microelectronics. "Widetronix Inc. has strong connections to Cornell University," says CEO Jonathan Greene. "The company maintains its connection to the University through its continued use of the Cornell Nanoscale Facility, as well as frequent consultations with researchers. These interactions... drive our desire to stay in proximity to the University."

Company address
950 Danby Road, #139, Ithaca, NY 14850

Contact
Jonathan Greene, CEO

jgreene@widetronix.com

(607) 330–4752

**Online professional
and executive development**
This program, offered to students around the world through eCornell, offers more than 20 award-winning certificate programs in leadership and strategic management, finance, marketing, and systems design, among other disciplines. New courses are added regularly.

**Intensive learning experiences
for professionals and executives**
Offered year-round by Cornell's School of Continuing Education and Summer Sessions, this program can be designed to meet the needs of corporations, professional societies, and other client institutions. The format ranges from semester-long credit courses to noncredit workshops.

Business Incentives and Support
Through initiatives and centers situated across the university, Cornell has created numerous programs, workshops, and awards that support and incentivize businesses in the area. A few examples:

MEng professional design projects
These College of Engineering projects match graduate students with companies up against real-world problems that involve chemical engineering, electrical and computer engineering, engineering physics, and operations research and information engineering. Industry sponsors of recent projects have included Goldman Sachs, Deutsche Bank, CERN, and the Canadian National Railway.

Big Red Consulting
This student-run consulting firm – based at the Johnson school of management – advises clients on efforts to support and expand their businesses. Participating companies have included American Innovative (consumer electronics), Laxified (Internet sports and recreation), Dancetracks Digital (Internet media), and Home Equity Share (Internet real estate).

**JumpStart program of the Center
for Materials Research**
Designed to help small New York State businesses solve concrete problems related to materials research, this program provides a semester of faculty expertise—including training in and use of the center's shared experimental facilities—and up to $5,000 in matching funding from the NYS Foundation for Science, Technology, and Innovation.

Unique and Distinctive Best Practices
In its many business engagements, Cornell consistently follows an interdisciplinary and collaborative approach, inviting companies to define and address their problems in the broadest light. Cornell's state-of-the-art research facilities bring faculty researchers from multiple disciplines together; many of these facilities and resources are open to industry scientists.

The University's various centers and affiliate programs use a single point-of-contact model that makes it easy for companies to get questions answered, while giving faculty members the flexibility to develop and maintain corporate relationships. The partnership model draws student groups into company information sessions, seminar series, project fundraising, research and consulting teams, and mentorship opportunities.

The Cornell NanoScale Facility
One of 14 members of the National Nanotechnology Infrastructure Network, the NanoScale Facility has a strong history as an interdisciplinary research center and central user facility across many areas of science and engineering. More than 350 non-Cornell entities a year take advantage of the open user facility (accessible 24 hours a day), whose resources and support staff help client companies build structures, devices, and systems. Most of the world's nanotechnology labs have sent representatives to visit the facility and learn from our model, although few have been able to reproduce anything like its high level of effectiveness.

Businesses Lured to the Ithaca Area

Haledyne

Haledyne is a UV-C Lighting technology development company that manufactures and distributes air sterilization products for use in broad industrial and commercial applications. Haledyne was selected as a recipient of a JumpStart program award through the Cornell Center for Materials Research. Cornell helped the company identify the necessary raw material component to formulate a proprietary UV-C-absorbant coating.

Company address
235 Harrison Street, Syracuse, NY 13202

Contact
Dr. John F. Zak, CEO

john.zakmd@haledyne.com

(315) 679–5141

Comet Skateboards

Comet Skateboards makes eco-friendly skateboards, using biodegradable composites made from plant fiber and a soy protein-derived resin. When Comet's boards are no longer serviceable, they can be ground up and turned into compost, thanks to research originally done by Anil Netravali, professor of fiber science and apparel design in Cornell's College of Human Ecology. Comet co-founder Jason Salfi '93 was so excited about Netraveli's work that he moved Comet's manufacturing facility to Ithaca in 2007

Company address
239 Cherry Street, Ithaca, NY 14850

Contact
Jason Salfi, Co-founder

(607) 277–0700

Primet Precision Materials

Primet Precision Materials is an advanced materials company dedicated to improving performance in solar cells, fuel cells, and other consumer-friendly industries. The company's processing technology permits the manufacturing of small (including nano-sized) particles from ceramics and metals, among other diverse materials. Seeking easier access to world-class materials science research and facilities, Primet's CEO relocated the company from Maryland to the Ithaca area soon after its founding in 2002. Today, Primet is commercializing the sale of Cornell technology and has forged strong working partnerships with our faculty, industrial relations staff, and technology transfer staff.

Company address
950 Danby Road #90, Ithaca, NY 14850

Contact
Larry Thomas, President & CEO

lthomas@primetprecision.com

(607) 277–0700

Cornell Center for Materials Research
In additional to the elements of its Industrial Partners Program, the center provides extensive assistance to companies looking to locate in New York State. It also manages a set of shared facilities where assistance is provided to more than 700 users annually. In 2010, these facilities were used by 51 academic researchers from 26 other institutions, and by 51 industrial researchers from 31 companies, in addition to on-campus users drawn from 35 Cornell departments and centers. The number of industry users has grown steadily; they generated 19 percent of the facility's revenue in 2010, compared to 6 percent in 2005. Companies such as Corning and GM have used some complex instruments that even large companies cannot easily afford to maintain and operate.

Energy Materials Center
Its long-term business partnerships deliver mutual benefits in three areas: information exchange, access to Cornell resources, and research support. The center has developed a suite of programs to help attract and retain company partners. Those programs include an Annual Energy Materials Symposium, technology demonstration days, research summits, scientific advisory board meetings, an energy researcher exchange program, innovation reviews by a panel of peers, technology training grants, and collaborative research projects. In partnership with the New York State Center for Future Energy Systems, the center also provides matching funding of 25 to 66 percent of overall project costs for company-supported projects that have a positive impact to New York State company partners.

Cornell Center for Advanced Human Resource Studies
Affiliated with the School of Industrial and Labor Relations, this center is the world's leading academic-and-industry partnership devoted to global human resource management. The partners represent more than 60 of the world's premier companies. Working directly with key faculty and students, business get to participate in, influence, and be the first to know about new research findings and applications.

Mentorship Initiatives
Capitalizing on its strong relationships with business leaders (including Cornell alumni), the University helps match companies with research faculty and students in a variety of learning and mentorship opportunities. These programs include:

• **Kessler Fellows:** Hosted at the College of Engineering since 2008, this year-long work-study program is designed for a select group of junior Engineering students interested in entrepreneurship and working in a startup environment.

• **Studio experience for architecture, art, and planning students:** AAP students get to live and study in New York City, while gaining valuable professional experience at design firms, studios, and innovative public, private, and nonprofit organizations throughout the city.

• **The Engineering Co-Op Program:** Integrating a student's academic and career interests with paid, productive work experience, this is a two-part program, in which students work full-time for one semester and one summer.

Business Expansion and Attraction (Technion)

Industry-Academia Cooperation

Historically, the Technion has contributed to Israel's economy by conducting applied research through direct cooperation with industries and other stakeholders; through the official channels of the government's European and Israeli Industry-Academia frameworks; through bi-lateral industrial R&D cooperation under the oversight of the chief scientist of the Ministry of Trade, Industry and Labor; and through the various applied R&D programs of the Ministries of Health, Defense, Agriculture and Rural Development, Transport and Road Safety, Construction and Housing, National Infrastructures, Environmental Protection, Science and Technology, and Interior.

The main Technion participation in industry-academia programs has operated through the schemes known as Magnet (3-6 year Israeli Industrial consortia in collaboration with Israeli academia aimed at the development of the next generation of technology through long-term generic-industrial R&D), Magneton (2-year technology-transfer from one academic partner to one industrial partner), and Nofar (15-month feasibility study for transfer of academic technology to an interested industry). All the mentioned schemes are promoted by the Ministry of Trade Industry and Labor, and draw on industry as well as government funds.

In the last year alone, Technion scientists have been involved in more than 85 individual projects within more than 17 Magnet consortia in the most advanced and cutting-edge topics in medicine, bio-medicine, food and packaging, electro-optics, communication, renewable energy, nano-electronics, and homeland security, among other areas. Nine Magneton projects and a similar number of Nofar projects were also underway last year.

Research cooperation projects have frequently led to additional research contracts, transfer of technology and intellectual property, and commercialization through licensing and start-up ventures within the incubator scheme or in other frameworks. These programs have often generated agreements to share pre-

competitive technology with consortia (Magnet) or to transfer specific technology to industry (Magneton and Nofar).

Illustrative Results

One outstanding example of the fruits of such programs is the EDCoT Magnet Consortium (http://magnet.consortia.org.il/EDCoT/). EDCoT (Emerging Dielectric and Conductors Technologies) operated in the years 2002-2006. It was a cluster of eight Industrial partners (Tower; NOVA; Nano-or; CI-systems; SELA; KLA-Yencor; AMT; Jordan Valley) and four Academic partners (HUJI, TAU, BIU, IIT). It operated during the worst crisis in the semiconductor industry. The consortium represented active, fruitful, and worthwhile industrial and academic partnerships that envisage the right technological and business approach toward the materials revolution, becoming a dynamic long-lasting successful consortium. All the industries in ADCoT gained sustainable (two digit) growth; three of these companies won the 2006 competition of the number one magazine Semiconductor International.

Another good example is the long-lasting fruitful technology-transfer process in a sequence of three Magneton projects operated by Professor Dan Adam of the Technion Faculty of Bio-medical Engineering and General Electric Medical Systems – Israel. The main topic of cooperation has been 3D echocardiography through projects designed to improve diagnosis with precise evaluation of cardiac temporal & spatial inhomogeneities, substrate analysis, workstation using MRI/US image fusion and real-time speckle tracking during stress echocardiography.

More than twelve years of cooperation yielded three successful patents: 0594 - Wavelet Depulsing of Ultrasound Echo Sequences; 0575 - Fast Implementation of Ultrasound Pulse Power Spectrum Estimation and 0962- Measures sensitive to post-AMI myocardial remodeling. The patents were licensed to GEMS followed by new commercially successful and improved products and with a continuous flow of royalties to the

Technion. Moreover, the synergy between the Technion and GEMS opened areas of common interest, new projects, and new fields of cooperation in the framework of Magneton and Nofar.

Till now, two GEMS products were developed due to the collaboration with the Technion: 2DStrain implemented on the EchoPAC workstation and AFI (Automated Functional Imaging) implemented on the cardiac ultra-sound scanners. The products are sold as an option on the cardiovascular scanners VividQ and Vivid S6 sold by the GE Haifa center as well as with/on all scanners sold by the GE Norwe-gian make center.

Technion-Company Bonds
Company relationships develop on multiple paths at multiple levels. Typically, they take one or more of the following forms:

Consulting, advisory-board membership by faculty members

Part-time student employment. Often continuing to full-time employment upon graduation,this serves (especially) local business both in recruiting and for selection of employees

Involvement of industry figures, often our own graduates, in student-project supervi-sion, teaching, and research collaboration. Although in most cases not directly related to their companies, this offers them three important benefits:

- First, they get the ability to offer prospective employees the option to stay involved with the Technion, albeit on a small scale, making a company more attractive to job candidates. This is particularly true as people believe that they will not remain with the same company or in the exact same professional field forever, making staying current and connected an important issue.

- Second, these people know our people, interact with students, and can easily recommend to their companies people they should try to interact with or recruit.

- Third, the exposure of these employees to the ongoing research at the Technion and beyond brings fresh air and expands the horizons of their companies.

Joint participation (individual researchers on the Technion side) in government funded R&D. There are three main mechanisms that are employed quite extensively:

- First, "Magnet" industry-university consortia. These 3-5 year undertakings typically involve some ten companies and a commensurate number of faculty members. The purpose is to collaborate in the invention and prototyping of key technology building blocks in fields with expected high international market growth, in which there is core expertise both in academia and in industry in Israel, as well as a desire to collaborate. The idea is, through substantial government funding, adminis-tered by the office of the chief scientist of the Ministry of Industry and Trade (matched by an additional 30% by industry members), to foster collaboration and the formation of a critical mass. This is important in a country that is characterized mostly by small compa-nies with leading edge capabilities in specific fields. IP generated in this process is the property of its creator, but a free license is granted to the other members. (With Univer-sity IP, there is some compensation.)

- Second, "Magneton". The same source of funding, but in this case a 1-1 undertaking involving a single faculty member and a single company. The purpose is to help convert ideas and core technology to products.

- Third, joint participation in international programs, be they bi-national ones or the large European consortia (FP7, for example).

Industry-funded research
Industry-sponsored student projects. At times, this is mostly a donation of some funds or equipment by companies for specific projects. In other cases, it actually seeds collaboration.

Industrial affiliates programs. These are typically at the department level. Paying members are invited to various events, get easier access to our people, etc. Also, we solicit their advice, criticism, requests and recom-mendations regarding both the teaching curriculum and research areas that they deem important.

Topical mini-symposia. These are held periodi-cally, serving as "knowledge boosters" in the

relevant field. In some cases, they expose companies to a new field or technology that may be relevant to them; in others, they serve as a meeting opportunity for people from various companies active in similar areas. Especially in a small country like Israel, this often turns out to be a socio-professional get-together, with new and renewed contact that continues beyond the event itself.

Strategic centers. These are formed at the Technion, usually at the department level but at times at the Technion level, in order to give a big push in an area that is deemed critical. This may be a new area or a neglected area whose absence is deemed extremely harmful to industry. Examples:

- Nano-technology (new)

- Bio-electronics combinations (new)

- Advanced Circuit Research Center (ACRC): RF CMOS technology and related issues are critical for the IC industry, but were largely neglected at the Technion. ACRC was established several years ago, with substantial funding from relevant companies, and serves to seed new activity. Already, many graduate students are active in this and closely related areas, along with faculty members, and there is ongoing participation by member companies.

- Energy research center (Technion center)

Technion Computer Engineering (TCE) center. This recently established center (EE + CS faculties) is singled out, because it represents an attempted leap in Technion-industry interaction. In addition to combining the forces of the computer engineering faculty members in the two departments, the idea here is that companies will send people to spend extensive amounts of time in the center, be it on a part time basis or full-time for a substantial duration, a Sabbatical of sorts. The benefit is expected to be mutual, as the flow of knowledge in this field is bi-directional. It will serve to "charge the batteries" of industry folks, while at the same time exposing faculty members and students to additional facets and broader considerations when developing systems or technologies for them.

Businesses that have Grown with the Technion's Help

Intel

IBM Haifa Research Lab
GM: Oded Cohn cohn@il.ibm.com

HP Labs Haifa (on campus)

Google Haifa

Yahoo Haifa

Mellanox (Yokneam)
CEO: Eyal Waldman eyal@mellanox.com

Marvell (Yokneam)
GM: Yossi Meyouhas yossim@marvell.com

Given Imaging (Yokneam)
Wavion (Yokneam)

Anapurna Labs (yokneam)
CEO: Hrvoje Bilic ("Billy") bilic.hrvoje1@gmail.com

Kaminario (Yokneam)
CEO: Dani Golan dani@kaminario.com

Cortica (Tirat Carmel)
CEO: Igal Raichelgauz igal@cortical.com

Qualcomm (Matam)
GM: Ayal Bar-David abd@qualcomm.com

Zoran (currently P/O CSR) – Matam

Elbit Haifa

Rafael

Recruitment and Training Programs

The Technion reaches out to existing companies to offer continuing education and training in a number of ways including:

- The aforementioned topical symposia and, for that matter, all talks and courses are widely publicized. In some faculties, companies that are members of the affiliates program are invited to send their students to attend courses (not for credit) free of charge.

- It is quite common for engineers working in high-tech industries to continue for an M.Sc. alongside their regular work. These students typically take much longer to complete their degree than a full-time student; while this has many shortcomings, the benefit is that they are actually affiliated with the Technion and its faculty members for a long time. Subsequently, we see more and more students and alumni who take care to stay connected in one way or another. These people also act as Technion ambassadors in their companies, helping the relationship at all levels and granularities.

- The Technion provides mentorship services for facilitating the formalization of a relationship when involving a faculty member acting as such (as opposed to as an individual consultant), a lab, or Technion facilities.

- The Technion helps support existing businesses mostly, though not exclusively, as part of the industrial affiliates programs:

  Topical symposia

  A string of short graduate student lectures to expose the activity and the students to our industrial friends

  Intensive short courses by Technion faculty or external experts in topics tha are of great interest to industry

Special programs as needed. Examples (taken from EE and CS):

- Conversion of B.Sc. holders to software engineering. This was done in response to a request by several companies that identified a developing mismatch between the skill sets of their (otherwise great) employees and the new needs.

- Training of electrical engineers in RF and antennas (again in response to a specific request)

- A "convenience" M.Sc. course program, designed for a major company so as to minimize the lost time of its employees. (Convenient hours and coordinated schedules of several course, not compromising quality or exam level.)

Unique and Distinctive Best Practices

Most of the Technion's unique and distinctive best practices for working with existing businesses have been mentioned above. It is worth noting that the activity is usually driven from the bottom up: in other words, it involves individuals on both sides rather than corporate or Technion decisions. At times, nonetheless, usually as a result of pressure building up from the bottom, it is recognized that action must be taken on a larger scale, leading, for example, to the formation of a center. The true uniqueness of the Technion approach is the intimacy of the relationship, which endures throughout years and job changes. Also, with so many independent links, the Technion-Industry relationship, while always having room for improvement, is extremely robust.

Bringing Critical Knowledge into the World

With its land-grant mission and research leadership, Cornell has attracted a world-class faculty in and across a remarkable range of disciplines. Our historic emphasis on public service, coupled with an unusual ethos of collaboration, has made Cornell a center for addressing many of the pressing issues of our time, including Internet security, sustainable design and development, and the quality and efficiency of healthcare delivery.

The basis of Cornell's leadership in research is its commitment to excellence in diverse and collaborative research. While other universities highlight the value of multidisciplinary research in the applied sciences, none can match Cornell's commitment to breaking traditional departmental silos. Unlike most peer institutions, Cornell organizes its graduate programs around cross-departmental "fields" of study, an approach that promotes interdisciplinary work as well as collaboration. Faculty members can join any field by a simple majority vote, and once a member they can supervise students within that field. This flexibility allows the faculty to engage a broad range of students and collaborate easily with their colleagues across the college and university. Furthermore, this same collaborative spirit is instilled in our students, many of whom work closely with others in different fields, thereby gaining an appreciation for the power of bringing together deep expertise in adjacent fields to tackle a problem that lies along the boundary.

Where It Starts
Perhaps no program exemplifies Cornell's cross-disciplinary approach better than the Faculty of Computing and Information Science (CIS), which was founded on the recognition that the ideas and technology of computing and information science are relevant to every academic discipline. CIS works with seven colleges and four professional schools at Cornell—from Engineering to Arts and Sciences to Human Ecology—to break down barriers not only between disciplines, but between the research world and the world of entrepreneurship and capital generation.

Within CIS, the Computer Science Department, ranked 5th nationally, has established itself as a leader in important areas such as distributed computing, trustworthy computing, social networks and large databases, all of which factor prominently in this proposal. Six members of the Computer Science faculty (20%) are members of the National Academy of Engineering, two are members of the National Academy of Science, and two have won the Turing prize. Additionally, CIS has one of the nation's first Departments of Information Science, currently unranked but a discipline is which Cornell has already achieved an international reputation. This discipline will be another core for the NYC Tech campus.

Cornell's College of Engineering (COE), the top-ranked engineering program in the Ivy League and ranked among the top 10 colleges in the country, has distinguished itself with uniformly outstanding programs across its eleven depart-

ments. Of particular significance to this initiative are the highly ranked departments of Electrical and Computer Engineering and Operations Research and Information Engineering. Additionally, faculty from Applied and Engineering Physics, Civil and Environmental Engineering and Materials Science and Engineering will participate in the NYC Tech campus. Within these departments are 30 members of the National Academy of Engineering.

This combination of outstanding disciplines provides a uniquely strong core upon which to build the applied sciences campus in New York City. However, the Cornell plan is much richer than that. Our proposal will leverage other top-ranked programs on our campus, such as Architecture (ranked 1st nationally), Communications and Nutrition.

Cornell Centers—the Spirit of Collaboration

Cornell has a remarkable track record of bringing interdisciplinary centers to life on the Ithaca campus. These centers are noted for their enduring collaborations across the academic units of Arts & Sciences, Agricultural and Life Science, Computing and Information Sciences, Engineering and the Weill Cornell Medical College. Many of these centers have existed for decades, passing through multiple peer review processes—a testament to their importance to the community and Cornell's ability to constantly reinvent its research activities so that they stay current and vibrant. Few institutions can boast this record of success. Below we describe a few of the more relevant centers.

The Cornell Center for Materials Research
CCMR, the "mother" of all centers at Cornell, was founded 1960 in the era of Sputnik as the first "interdisciplinary laboratory" (IDL) in the U.S. After more than 50 years, this National Science Foundation–funded entity is a member of the national network of Materials Research Science and Engineering Centers and provides state-of-the-art experimental facilities on all aspects of synthesis and analysis of advanced materials. CCMR's JumpStart Program, with funding from the New York State Foundation for Science, Technology, and Innovation (NYSTAR), now part of the Empire State Development, channels Cornell research and technical expertise to regional businesses, new and existing.

The Cornell Nanoscale Science and Technology Facility
For more than 30 years, CNF has been a user facility for researchers to manufacture devices at nanometer length scales. The facility provides state-of-the-art equipment and cleanrooms at reasonable costs on a standard user-fee basis, with support staff who have strong technical competence and experience in product prototype fabrication, testing, and development. The facility serves not only the Ithaca campus and companies in central New York but also our campus and businesses in New York City. Moreover as the lead institution of the National Nanotechnology Infrastructure Network, Cornell coordinates similar facilities at 13 other sites. CNF and the broader NNIN have been invaluable resources for maturing Cornell technologies for commercialization and spinoffs. New businesses founded by Cornellians, such as Kionix, Inc., Transonic Systems, and Mezmeriz all benefitted from CNF.

From Research to Commerce

Transonic, which recently broke ground on a 30,000-foot expansion of its headquarters and manufacturing facility at the Dutch Mill Business Park in Ithaca, specializes in high-quality flow-measurement technology. Founder Cornelis J. Drost developed the company's first major product, the transit-time flowmeter, while working as a Senior Research Scientist at Cornell's College of Veterinary Medicine.

More recently, Transonic scientists have worked closely with the Cornell Nanoscale Facility on the development of a sensor for the measurement of cardiovascular flows in mice. "The outstanding knowledge and willingness of the staff to advise us on the project has enabled us to successfully bring this product to market, and to further the research of groups that are conducting research in the field," says research and development scientist Thomas Pennell.

The Institute for Biotechnology and Life Science Technologies

This institute, which helps translate research results into licensable technologies and spinoffs, is home to the Center for Biotechnology, one of four statewide Centers for Advanced Technology (CAT) with a mission of promoting the transfer of technology for applications. The institute is also the home of the McGovern Family Center for Venture Development in the Life Sciences, which focuses on providing assistance to new venture development using Cornell research results. The institute's CAT Grant Program further provides funding to encourage university-industry interactions and the translation of basic discoveries into licensable technologies for both spinoffs and existing businesses.

Other major multidisciplinary centers at Cornell include:

• Center for Nanoscale Systems—www.cns.cornell.edu

• Cornell Center for Advanced Computing—www.cac.cornell.edu

• Developmental Resource for Biophysical Imaging Optoelectronics—www.drbio.cornell.edu

• Energy Materials Center at Cornell—www.emc2.cornell.edu

• Nanobiotechnology Center—www.nbtc.cornell.edu

• Cornell Agriculture and Food Technology Park—www.thetechnologyfarm.com

• Cornell High Energy Synchotron Source—www.chess.cornell.edu

Maximizing Public Benefit

Academic science used to be something of a world unto itself. Commercial projects were seen as incremental because development tended to be a drawn-out process. The paradigm of a successful university career was to get an NSF grant (or a string of them), and plunge into an area of intellectually challenging research.

In a few short decades, that old mindset has been augmented by a new research paradigm that recognizes the benefits, in the applied science fields, of strong ties with industry and commercialization activities. The timeline between the Eureka moment and commercial validation has shortened dramatically. In today's world, technology can move from brilliant insight to real-world impact in the space of a year or two (shorter in software industries), and students and faculty are motivated to start companies in order to have a hand in making the things they have imagined and designed into reality.

Cornell, with its long tradition of engagement in economic development, has been ahead of the curve in adapting to the new environment. While the university remains strong in basic research, consistently ranking in the top five in NSF funding (and among the nation's top academic institutions in research expenditures across the board – spending a total of $764 million in FY 2010), Cornell has moved boldly and thoughtfully to support the kind of research, both scientifically-driven and commercially-focused, that advances the development of new technology. We have been doing this in the Ithaca region and nationally for years. Cornell is poised to dramatically expand our embrace of research that matters to NYC's key industries. As a basic part of NYC's tech ecosystem, we look forward to using our research to launch new companies and expand existing ones, retaining this business activity—and jobs—in the City.

Cornell has approximately $48M in current research contracts from the Computing and Information Science and Engineering Directorate at the National Science Foundation (NSF CISE). This is approximately the same as the total of all such funding for the schools in New York City.

"Personally, I have been conducting research at the Cornell Nanoscale Facility for many years... and cannot say enough about the amazing work that goes on at the facility."

The company's current expansion plans will generate as many as 100 new jobs in the Ithaca area.

Many other discoveries have made the journey from Cornell's research labs to successful commercial production and wide use.

The amazing breadth of Cornell's research includes large-scale projects that will improve the wellbeing of our national and global societies, ingenious smaller projects that will lead to breakthroughs in many different fields, and scholarly work that supports and enhances the spirit of humanity.

Research Culture and Process for Tech Transfer

Results of the vibrant Cornell research enterprise typically are first captured through a broad spectrum of outreach activities on the part of The Cornell Center for Technology Experience and Commercialization (CCTEC) and its partner academic units. These activities increase awareness among researchers of the value of their results, encourage the timely reporting of findings, and help promote a culture of entrepreneurship and proactive interactions with industry.

Once research results are reported to CCTEC via a written disclosure process, the results are assigned to licensing professionals at CCTEC who have the proper technical and industry background for assessment and management. The assessment includes direct interactions with the researchers for detailed and in-depth analysis of results (such as identifying the additional development work that may be required and the costs associated therewith), landscape research that includes market potential evaluation, and placement and protection strategy that typically focuses on maximizing regional economic development potential.

CCTEC engages the wisdom of a widely distributed Industry Advisory Group and industry-specific networks of alumni and friends of Cornell who are actively involved in technology industries using modern information technology. The Cornell BioPharma Network and the Cornell NanoMat Network are examples of these special interest social networks. (See www.cornellboration.com.)

CCTEC's process reflects its philosophy of maximizing the public good. In a typical fiscal year, between 10 to 15 percent of the licenses issued by CCTEC go to new businesses, the majority of them located in New York State. The remaining licenses are granted to existing companies with a preference first for New York State companies, then U.S. companies, and finally global companies. (An outline of CCTEC's general process can be found at www.cctec.cornell.edu/inventors/techtransferprocess.php.)

National Academy Memberships

Forty-one Nobel laureates have been affiliated with Cornell as faculty members or alumni. A total of 17 current Cornell faculty members were elected in 2009–2011 to the National Academy of Engineering, the American Academy of Arts and Sciences, and the National Academy of Sciences.

Memberships	Number of Cornell faculty
American Academy of Arts and Letters	4
American Academy of Arts and Sciences:	88
American Philosophical Society	13
Institute of Medicine	18
National Academy of Engineering	30
National Academy of Sciences	43
Total Memberships	196
Multiple Cornell "Memberships" in the Academies	111
Single Cornell "Memberships" in the Academies	85
Single Cornell Memberships excluding Weill Cornell Medical College faculty	75
Total Number of Cornell Faculty in the Academies	135
Number of Ithaca Faculty	118
Number of Ithaca Faculty with Multiple Memberships	43
Number of Weill Cornell Medical College Faculty	17
Number of Weill Cornell Medical College Faculty with Multiple Memberships	7
Total Number of Cornell faculty with Multiple Memberships	50
Total Faculty Population	2,771
Ithaca Faculty	1,565
WCMC Faculty	1,206

Funding Sources For Sponsored Research

Funding Sources for Research	FY2008	FY2009	FY2010
	By Dollars Expended (in thousands)		
Total Federal Sources	377,896	383,246	461,169
Sponsored Research	368,540	375,118	453,773
Appropriated Research[1]	8,128	9,356	7,395
Total Nonfederal Sources	290,331	304,185	303,076
Overall Total	668,227	687,431	764,245
Sponsored Research	111,829	132,160	108,337
State and Local Governments	20,449	25,917	15,995
Corporations and Trade Associations	25,947	27,715	21,749
Foundations	25,996	36,066	54,767
Nonprofit Organizations	37,919	41,913	15,490
All Others	1,518	548	337
Appropriated Research	178,502	172,025	194,739
Cornell Support[2]	123,476	117,888	144,211
New York State	55,026	54,137	50,528
U.S. Federal Agencies			
Department of Health and Human Services	190,792	192,485	223,411
National Science Foundation	116,000	115,067	141,941
Department of Defense	16,428	19,759	24,576
Department of Agriculture	16,227	17,204	22,226
Department of Energy	7,195	9,519	14,233
National Aeronautics and Space Administration[3]	10,599	10,538	13,175
Agency for International Development	2,822	2,213	2,521
All Others	8,476	8,332	11,690

1. Includes sub-awards of federal funds from other universities, national labs, non-government organizations, etc.

2. Consistent with NSF reporting guidelines, university support includes institutional cost sharing, GRA tuition fellowships, university seed research grants, unrecovered facilities and administrative costs, and organized research allocation of NYS-funded employee benefits.

3. NASA includes JPL funds under subcontract.

Research Capabilities and Track Record (Technion)

The Technion has a long history of pioneering applied science and engineering research and development in Israel. One may begin with the establishment of the Faculty of Aeronautical Engineering in the fledgling State of Israel in 1953, a visionary step that has led to the development of Israel's impressive aerospace engineering companies of today – such as Israel Aircraft Industries the majority of whose applied scientists and engineers are still trained at the Technion.

In the late 1960's, the Technion entered the sphere of micro-electronics and also established a Faculty of Computer Science, which together provided the innovations and the manpower for Israel's highly sophisticated and economically successful high-tech industry sector. At the same time the Technion incorporated a Faculty of Medicine into its academic activities with the explicit desire to train medical students with technological understanding. A significant byproduct of this step was the developing collaboration between applied science and engineering researchers with medical clinical faculty, leading to many innovations in medical devices and healthcare technology.

In the past decade the Technion has established several very successful

multi-disciplinary research programs that have been based on significant research funding obtained from donors and philan-thropic foundations, as well as from government support. These include the Russell Berrie Nanotechnology Institute – a $100M virtual institute that involves some 100 faculty and 80 graduate students, and provides infrastructure for research and development on campus and for industry. Another example is the Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering – a $50M virtual institute that attracted new faculty with applied physics and engineering backgrounds to work on the interface between life sciences and engineering.

The Grand Technion Energy Program is a relatively new program composed of modules covering a broad spectrum of topics in alterna-tive and sustainable energy sources. This $50M program is a quintessential example of an applied science research endeavor, involving materials science and engineering (e.g., photo-voltaic research), applied biology (bio-fuels research), mechanical engineering (wind power research), applied chemistry (battery and fuel cell research), as well as other disciplines. The Technion Autonomous Systems Program is another example of a distinctly applied science and engineering

Total Technion Research Funding

Source	2008 $M	2009 $M	2010 $M
Extramural research grants	64.4	61.7	65.2
Donations for research infrastructure or research programs	14	17	12.3
Start-up equipment for new faculty	8	6.2	4.2
Government support for the absorption of new immigrant scientists	3.8	4	4
Encouragement of faculty research activities:	2	1.5	1.1
Fellowships for graduate students	19	18	20.4
Chairs, etc.	1.6	0.6	0.6
Total Research Funding	**112.8**	**109**	**108**

research program. It is a $25M program pursuing research on topics such as unmanned aerial vehicles (UAVs) and satellites, unmanned ground and marine systems, autonomous medical systems, multiple autonomous agents, and household and industrial robotics. This program has attracted significant funding from industry.

Currently, the Technion is inaugurating the Technion Computer Engineering Center, which will enhance even further our cooperation with the IT industry, and will attract more students to computer architecture, computer systems, imaging sciences, and other areas of IT and computer engineering.

Alongside these research programs, the Technion has established master's and PhD degree programs which serve the dual purpose of providing support for the cutting-edge research on campus, as well as providing trained graduates who will transfer their research knowledge to the industries that develop in the relevant domains.

Based on this proven experience, the Technion faculty and administration are well positioned to identify domains of applied science that have the potential to develop significantly in the near future. Moreover, the Technion management knows how to attract and develop the core faculty and how to start domain-rele-vant educational programs in applied science and engineering.

Technion Milestones

Over the years, the Technion has become well recognized for its scientific and technological breakthroughs.

- The file compression algorithm used for "zipping" files was developed by Prof. Abraham Lempel from Computer Science and Prof. Jacob Ziv from Electrical Engineering, and has become an international standard for data compression, and an IEEE Milestone for which both its inventors were awarded the IEEE Hamming Medal.

- The PHP web language rewritten by Zeev Suraski and Andi Gutmans as a student project, became a world standard, and was later commercialized by Zend Technologies which they founded upon graduation.

- In 2004 Prof. Avram Hershko and Prof. Aaron Ciechanover of the Technion`s Department of Medicine were awarded the Nobel Prize in Chemistry for their discovery of ubiquitin-mediated protein degradation.

- The Azilect® drug for Parkinson's disease was developed by Prof. Moussa Youdim and Prof. John Finberg, and is currently sold by Teva Pharmaceutical Industries all over the world.

- Most recently, the Nobel Prize in Chemistry for 2011 was awarded to Technion Prof. Dan Shechtman for his discovery of Quasicrystals. Three of the four Israeli scientists who have won the Nobel Prize in the physical sciences are Technion professors.

Image Left
The Technion's Ruth and Bruce Rappaport Faculty of Medicine

Image Right
Micro-robot designed to navigate through the human circulatory system

Research Grants

The Technion has always contributed to Israel's economy by conducting applied research. Technion scientists are frequently granted research contracts by Israeli government agencies, including the Ministries of Health; Industry Trade and Labor; Defense; Agriculture and Rural Development; Transport and Road Safely; Construction and Housing; National Infrastructures; Environmental Protection; Science and Technology; and Interior. In addition, Technion participates in industry-academia programs such as Magnet, Magneton and Nofar which are partially funded by industry as well as by government funds.

These programs often lead to pre-competitive technology shared by consortium in the most advanced topics (Magnet) or specific tech-nology transfer (Magneton and Nofar). For example, over the last year Technion scientists were involved in more than 17 Magnet consortia, 9 Magneton projects, and 9 Nofar projects.

Technion scientists have successfully applied to competitive and prestigious national, bi-national, European, and international research grants. In particular, over the last year Technion scientists have excelled in obtaining the most competitive Israeli grants from the Israeli Science Foundation (ISF), the US-Israel Bi-national Science Foundation (BSF), the Bi-national Agricultural Research and Develop-ment Fund (BARD), and the German-Israeli

Foundation for Scientific Research and Development (GIF).

In 2009-2010, Technion researchers have obtained 13% of all ISF grants, 27% of all BSF grants and 30% of all GIF grants.

In 2010-2011, Technion researchers have obtained 14.5% of all ISF grants (and 24.4% in science & technology), 13% of all BSF grants and 30% of all GIF grants.

In 2011-2012 Technion researchers succeeded in about 50% of submitted proposals to ISF grants. This is the highest rate as compared to previous years. In science & technology, Technion researchers achieved 25.6% of ISF grants, more than any other institution in country.

For BARD grants - in 2009, 2010 and 2011 Technion researchers were awarded 2 grants each year, which equals to 8% out of all BARD grants (3 years grant).

Technion researchers have secured over 55M Euros in FP7, the European 7th Framework Program. Among the grants, 17 are ERC Starting Grants, the most prestigious grants for researchers in their first 12 year, and three are Advanced Grants for the more established researchers. In addition, over the years, Tech-nion researchers have won several NIH grants.

Faculty Profile
Alan Hedge

Smarter Buildings, Healthier People

"Buildings are really dumb with regard to what's going on outside," says Alan Hedge, an internationally known expert in workplace design and ergonomics. And even dumber, he adds, when it comes to knowledge of their occupants. "Even so-called 'intelligent buildings' track only a few environmental variables," Hedge points out.

Hedge, a professor in the Department of Design and Environmental Analysis at Cornell University, is conducting research to improve the health, comfort, and performance of people in workplaces through advances in ventilation, lighting, acoustics, energy, ergonomics, and complex monitoring systems. He has been an integral part of several major New York-based initiatives, including the Indoor Environmental Quality Center, which applies this kind of research to the problem of creating jobs and economic opportunity.

Hedge takes particular interest in the improved sensing technology that will become possible with the development of a new microchip-based wireless system currently being pioneered by Intel. In the not-so-distant future, he envisions hundreds of thousands of sensors in a single building, all talking to a controller about the building's conditions and needs.

New York City would be a wonderful place to carry on this research, in Hedge's view. "The variety and scale of buildings in small areas would make a phenomenal test bed for research on improving the built environ-ment," he says.

2

DRIVING INNOVATION AND ENTREPRENEURSHIP

Mike Paolucci '92

is a serial entrepreneur with an amazing array of New
York City startups to his credit. He co-founded and
currently serves as CEO of Solvate, a cloud-computing
service that gives companies easy access to a community
of trusted freelance professionals. (New Yorkers account
for half of Solvate's talent pool.) In 2007, he founded
StartupExchange, an online community for entrepreneurs
seeking to pool their equity in the interests of financial
diversification. He is also the founder and Chairman
of Slooh.com, a live online astronomical observatory
(for which he holds the patent). A 1992 Cornell graduate
(in Economics), Paolucci co-founded the publicly traded
online advertising company 24/7 Real Media.

2. Property Interest and Structure

Site

Cornell has carefully reviewed each of the sites offered by the City and has determined that the former Goldwater Hospital site on Roosevelt Island is clearly the best option for accommodating the University's research and teaching needs and fostering its commercial partnership mission. The Roosevelt Island site provides quick and easy access to Manhattan and the East Side medical research corridor in addition to offering a site large enough to accommodate a multi-phased campus development of up to 2.1 million square feet. Roosevelt Island's unique location and position both distinct from the "proper" Borough of Manhattan have allowed it to serve a unique role as a laboratory for innovative urban initiatives since the implementation of its original master plan. Cornell will be proud to continue this history by developing an urban campus community that places New York City at the forefront of technological discovery and application. Roosevelt Island is also central to Cornell's vision of how we will participate in New York City's burgeoning tech ecosystem. Indeed, it is a vital link in a technology corridor that follows the subway's F-line from New York City's established tech hubs in Manhattan through Roosevelt Island to the increasingly lively commercial centers of Long Island City and Western Queens, neighborhoods that we see as integral to accommodating the space needs of companies incubated at the tech campus.

Cornell proposes leasing the entire 10-acre site on Roosevelt Island that is owned and controlled by the City of New York and designated as Block 1373, Lot 20. The preferred term of the lease and desired purchase option is more fully described in Section 2.02.

As part of its environmental sustainability goals, Cornell will develop a dense urban campus yet retain ample open space and land to accommodate installation of solar panels and other initiatives detailed in Section 7. Because the present Goldwater Hospital campus boundaries extend only five feet beyond the outer face of the Goldwater buildings, this will not be feasible unless the areas between the present Goldwater boundaries and the roads surrounding the Goldwater campus are be incorporated into Cornell's development plan. In particular, Cornell wishes to include as part of its leasehold the contiguous Roosevelt Island Operating Corporation (RIOC)-controlled areas that extend from the property line of Goldwater Hospital to the edge of all adjacent roads. This additional RIOC-controlled land represents approximately an incremental 100,000 SF that would be included in the ground lease for a total of 13.7acres. Ideally, the NYC-UDC Lease will be amended to exclude these properties from the RIOC leasehold premises, so they can be directly leased by EDC to Cornell. In addition, it is likely that certain easements over the RIOC property will be required.

Site Control Structure

Because of the extended period of time required for development of the entire project, and the fact that different project components are likely to be developed by different entities with different sources of financing, development of all project components under a single lease is not advisable. Accordingly, Cornell proposes the following development structure for the project:

Following all public approvals and fulfillment of all closing conditions, the City of New York will enter into a lease with NYCEDC which will be assigned to an entity of Cornell University, the Developer. This lease (the "Predevelopment Lease") will deliver possession of the Site, will describe the Project and development structure, will provide for division of the property into development parcels, and will set forth the respective obligations of the parties, including the obligation of the Developer to develop the Project in accordance with the Public Approvals, an established Project Schedule, and other terms that have been agreed between the parties (the "Development Plan"). As additional portions of the Site become available, the Predevelopment Lease will be expanded to include those portions. Under the Predevelopment Lease, Developer will perform site work and remediation, install infrastructure, stage construction being carried out on the Site, construct landscape improvements and perform other tasks as agreed upon with the City.

When an individual parcel is ready for construction, it will be severed from the Site and a new tax lot comprising that parcel will be created (a "Development Parcel"). The Predevelopment Lease will be severed and partially assigned and then amended and restated so as to comprise a Severance Lease for that Parcel. The Severance Lease, the form of which will be

attached as an exhibit to the Predevelopment Lease, will provide for construction of the particular improvements to be constructed on that Development Parcel, and a guaranty of completion of those improvements will be delivered to NYCEDC. A separate Severance Lease for each Development will be required in order to permit construction and permanent financing of the improvements to be constructed on that Parcel, with appropriate lender cure rights. Each Severance Lease will be for a term of 99 years and contain a purchase option. In the case of property used for academic purposes, the property will be conveyed to Cornell for one dollar, with covenants to continue to use the property for academic purposes. In the case of property being used for commercial purposes, the option will call for payment of fair market value. To the extent necessary or desirable to fulfill Project obligations or to operate the various facilities and provide common services, etc., the tenants under the Development Leases can enter into a Reciprocal Easement and Operating Agreement or form a Property Owners Association which will define responsibilities, allocate costs, and outline additional obligations of the parties.

Cornell believes this development structure serves the needs of the City and the project and will enable the project's separate components to be individually constructed and financed while linking them together under an overall development plan.

DRIVING INNOVATION AND ENTREPRENEURSHIP

Cheryl Yeoh '05

is a co-founder and the CEO of CityPockets, a Flatiron
District startup that organizes users' purchases from
daily-deal sites across the Internet. CityPockets recently
closed a seed round of $735K from Great Oaks Venture
Capital. In June 2011, Yeoh was named one of "25 Women
Driving NY's Tech Scene." In a previous life, she was a
management consultant for KPMG and Opera Solutions.
She received a Cornell BS in Operations Research and
Industrial Engineering in 2005, followed by an M.Eng
in Engineering Management in 2005.

3. Proposed Project

Engine of Enterprise

In partnership with New York City, Cornell University and the Technion will create a state-of-the-art engineering and applied science campus that will serve as a magnet for world-class talent. The new campus will generate a critical mass of entrepreneurs and a steady stream of jobs and tax revenue, empowering the city to establish itself as the capital of technological innovation.

Driving technology innovation

The mission of the NYC Tech campus is to drive technological innovation in the tech sector of New York City's economy, by significantly expanding a crucial city resource: highly talented people who are savvy in both the technical and business aspects of starting and growing companies, and motivated to build those companies right here because of their close ties to the city's tech ecosystem. Everything about the institution that we are building, from the physical design to the admissions process, courses, and project work, has been planned around this mission, and with the particular needs and character of New York and its burgeoning tech scene strongly in mind.

The past, present, and we strongly believe future strength of the tech scene in New York City is its connection to the large information-driven industries and cultural activities that make the city unique in the world. This can be seen in the 1980's success of the financial tech sector, with its close connection to major financial firms. In the 1990's and 2000's, companies such as DoubleClick and Right Media have had a similar impact on the advertising industry. And continuing today, the current set of consumer oriented tech companies like Etsy, Tumblr and Foursquare, and

many other smaller firms that are focused on technology to meet end-user needs, have success that is strongly connected to their deep engagement with those users. We refer to this as technology "pull," in contrast to the more generic tech "push" that fueled the boom of Silicon Valley and the Boston area since the 1970's. To best meet the needs of New York's tech sector we are focusing on tech "pull" which is about technology that is designed in close collaboration with the user (where the user defines the need).

"Hub"-Centered Program

Designed around its mission of accelerating technology "pull" in New York City, the campus will eschew traditional academic departments and be organized instead around flexible, dynamic, interdisciplinary hubs. Hubs will be multidisciplinary in nature, containing faculty that span the areas of expertise required to drive technology directed towards a particular sector of the city's economy. Hubs will be agile and flexible, able to change their research directions in time scales on the order of years, rather than the decades or more associated with traditional departments. They will evolve in time–some will grow, others will morph, still others will die and be replaced by new ones. The flexibility of the hubs will enable them to remain current even as industry needs and technology changes in ways that are impossible to predict.

The educational mission of the NYC Tech Campus will take advantage of the hubs. At its opening, the campus will offer Cornell degrees in traditional fields such as Computer Science, Electrical and Computer Engineering, etc., but the academic programs for these degrees will have additional interdisciplinary requirements related to each hub, such as collaborative projects and mandatory internships in related companies. This interdisciplinary environment will prepare students for careers in tech companies large and small; it is rare that the problems to be solved are purely technical, but rather involve using technical knowhow together with domain expertise. Moreover, these degrees will require courses that will prepare students to be entrepreneurs and venture capitalists, fueling the rapid expansion of the tech ecosystem in New York. The Technion-Cornell Innovation Institute will develop a highly novel Technion-Cornell dual Master of Applied Sciences, with tracks in each of the hubs (as described later in this section). This degree will require accreditation through the New York State Department of Education, but once approved will provide students with an unparalleled breadth of studies from which they may choose.

The interdisciplinary hubs will draw upon, and be grounded by, the outstanding academic standards of both Cornell and the Technion. Tenure track faculty on the NYC Tech Campus will have their tenure homes in traditional departments at either the Ithaca campus at Cornell or the Technion in Israel. Tenure processes will mimic those on the parent campuses, and tenured faculty will have the same guarantees as faculty on the main campuses. As hubs evolve, faculty will have the opportunity to move from one hub to another, or have multiple hub homes. So their work environment will remain flexible, while they still enjoy the traditional academic freedom of tenure. We believe it is essential to have the same high tenure standards on the NYC Tech Campus in order to be able to recruit the best and brightest faculty who will want to be recognized as full and regular members of these outstanding universities.

Hub-Centered Program

Connective
Media Hub

Healthier
Life Hub

Built
Environment
Hub
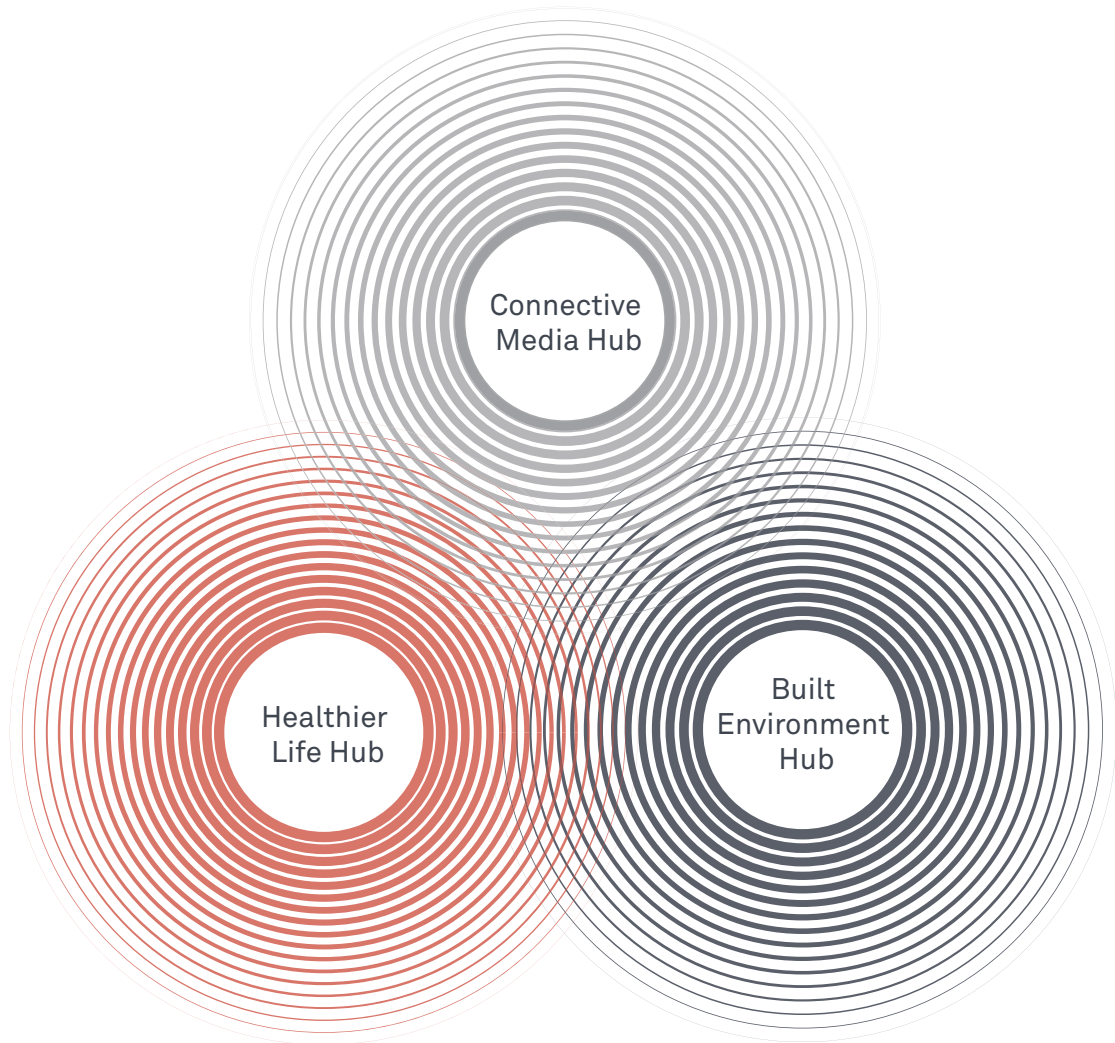
Hub-Centered Program

Connective Media Hub

Many of the major technological developments of the 19th and 20th centuries have been information and communication technologies. With the rapid development of mobile computing and communication technologies over the past two decades, it is easy to focus on the technologies themselves, whereas historically it has been the use of these technologies that has produced a considerably larger economic impact. For example, consider the broadcasters, cable operators, and content creators for television compared with television equipment manufacturers, or in earlier technology generations the movie studios and newspapers compared with the manufacturers of film and printing technology. Even with the relatively new and rapidly changing communication technologies of the internet and mobile devices, we are beginning to see a similar shift, from value creation driven by technology development to applications such as social media or online retail that are not about technology but rather are about peoples' needs.

The use of computing and communication technologies is driven by the fundamental human need for shared experience. While the internet has opened up a host of new means for sharing experience, these are in their infancy both in terms of technological development and even more so in terms of how they address the ability to share and communicate. An interesting early example is in the retail sector, where successful internet retailers such as Amazon or Netflix benefited considerably from the new kinds of shared experience that they offer their customers through mechanisms such as reviews and recommendations. More broadly, much of the success of leading internet companies such as Facebook and Google is again tied closely to how well they harness collective human experience and make that available in useful new ways.

The rapid changes in how people share their experiences offer huge opportunities for creation of new companies and even new industries. However, a serious challenge in pursuing these opportunities is that such companies and industries are about human behavior, needs, creativity and design as much as they are about technology—thus much of the value will come from bridging the gap between technology and people. New York City is better positioned to bridge this gap than any other city in the world, with its high concentration of creative and content industries, and with the growth of its burgeoning young technology sector. Perhaps the most critical factor for success, however, is to help New York's tech sector recognize the larger opportunities of technology 'pull,' in sharp contrast to the dominant approach nationally which is to emphasize the technology itself and thereby accentuate the gap. As a national leader in research and education that integrates the social sciences with technology, Cornell is ideally positioned to help New York City grow its technology sector in a way that bridges the gap between technology and its use.

Research Base

The faculty, researchers and students in the Connective Media hub will be from Information Science, Computer Science, Electrical Engineering, Communication, Sociology, Economics and Psychology. Those from the computing fields will have considerable social science expertise, and those from the social sciences will have considerable technical expertise.

Research will be organized into broad areas illustrated by the examples shown below.

Example 1: Social network data mining, analysis and modeling

The vast traffic of communication generated by Facebook and Twitter on the topics of the day provides interesting opportunities for gauging the mood of the country on these topics, equivalent to running large surveys of the population. Data mining techniques allow you to collect and parse the data, but achieving a true understanding requires interpretation. Moreover, techniques are required to distinguish attempts to "game" the system (by generating false traffic) from the true opinion. For example, Professors Claire Cardie and Jeff Hancock have developed algorithms for detecting fake positive reviews on online travel and retail sites. People turn out to be very bad at identifying fake reviews, but they have shown that algorithms can achieve 90 percent accuracy. This research brings together natural language processing techniques from computer science to analyze the text of the reviews with social science research on detecting deception in online communication. The work has substantial practical

applications in maintaining the integrity of online reviews.

Example 2: Managing social links of different type

The networks that connect people in social applications tend to be presented to users as a largely undifferentiated set of links; they are not annotated in a way that exposes the different strengths in the connections, the histories of interaction, the attitudes that people have toward each other, or the roles that different individuals play in a person's life. This is one of the most striking ways in which the representations of on-line social networks fail to capture the richness of social interaction in users' real lives. Nor is there currently much algorithmic support in these systems to support richer representations. We are investigating methods that can organize, structure, and represent the various roles that links play in a social network, and we will explore the ways in which social applications can be augmented with an identification of such roles. This will include research on the different strengths of links, the attitudes (both positive and negative) that are expressed across links, and the structural roles that different links play in bridging different groups and reinforcing connections within groups.

Example 3: Querying geo-social data by bridging spatial networks and social networks

Cellular phones and GPS-based navigation systems allow recording the location history of users, to find places the users frequently visit and routes along which the users frequently travel. This provides associations between users and geographic entities. Considering these associations as edges that connect users of a social network to geographical entities on a spatial network yields an integrated socio-spatial network. Queries over a socio-spatial network glean information on users, in correspondence with their location history, and retrieve information on geographical entities based on statistical properties of the users who frequently visit these entities. We will develop new data models for compact storage of socio-spatial networks that overcome the heterogeneity of the networks by bridging the social data and the geo-spatial data. We seek efficient means for storing and querying the data in multiple ways to study, for example, relationships among users, while ensuring the privacy of individuals. The ability to discover the similarity among users has immediate implications for media and advertisement. However, broader fields from transportation systems to modeling the spread of infectious diseases will be impacted.

Example 4: Incentives for developing high-quality information resources

A particular and valuable activity that on-line groups engage in is the creation of information resources. The information in high-quality on-line medical forums, the discussions that take place on successful academic blogs and question—answering forums, and the resources on Wikipedia and related sites provide clear examples of what such groups can achieve when they are successful. But in a large fraction of cases, groups that come together for this purpose fail to produce information resources of any significant value. How do we design mechanisms that lead groups to produce high-quality information resources? To understand this question, we need to investigate the multiple aspects that such mechanisms may potentially involve; these include incentives for individual effort, the matching of people with topics on which they have expertise, the regulation of bad behavior, and the handling of contradictory or incorrect information.

Example 5: People-aware computing

The research area of people-aware computing develops methods for analyzing and interpreting people's context, activities and social networks from data that is increasingly available from a wide variety of online sources, particularly mobile devices and sensors. As sensor equipped mobile devices become commonplace, they can be used to enrich and support communication and collaboration, measure and improve task performance, and transform the assessment of health and wellness via continuous behavioral analysis. A key challenge in this domain is to build efficient machine learning algorithms that transform low-level sensor traces collected in noisy real-world environments into descriptions of high-level human activities. These systems need to learn models of behavior without requiring significant human effort. For instance we have developed new models that parameterize people's behavior in a human-interpretable yet computationally efficient manner, making them more accessible to

Hub-Centered Program

researchers from other disciplines. The eventual goal of such research is to build systems that recognize individual and group-level activities in a manner that is robust, self-extending, and unobtrusive.

Example 6: Extending social networks

The ongoing growth of the enterprise portal market constantly requires development of new tools and feature sets for smart data management. Social protocols are automation tools for social networks that govern the network's structure, and the way data is communicated within and without it. Social protocols enable all of the connectivity features that make a network social. For example, when you are invited to a party using the Facebook Events feature, you have the option to answer tentatively with a 'yes', 'no' or 'maybe'. Since your response is visible to the other invitees, it may affect their responses. In fact, the social protocol behind 'Facebook Events' directly impacts the party's organization by providing these particular options for response. The idea behind the Generic Social Protocol is to create a malleable protocol that can be adapted by users. By applying protocol modifiers, an event initiator can have greater control over the behavior of their invitees. For example, assume that a company wishes to recruit employees using the "a friend brings a friend" method. An event is initiated by sending an initiation message to any desired set of network members. By applying protocol modifiers, you can define that only company employees will enjoy the privilege of forwarding the

message to their social network friends outside the company, whereas others can only view the message. In this manner you control the information sharing. A tool such as this can improve an organization's productivity, streamline its work process, and supplement social networks on enterprise portals.

Other potential research topics include:

- 3D imaging on mobile devices
- A privacy-preserving P2P social network
- Multi-user gaming on smartphones

Education

Students in the Connective Media hub generally will be in masters and doctoral programs such as Computer Science, Electrical and Computer Engineering and Information Science. Engineering and computer science students will be required to take at least one social science methods class such as a user experience course; conversely, information science students will be required to take some computer science classes as well as the proposed new MASc program. The curricula will prepare students for jobs as software developers, user interface designers, user experience engineers and technical product managers in media, advertising, and related commercial sectors.

Industry Connections

The hub's research and economic impact will connect with several large commercial sectors in the city including advertising, banking, healthcare, hospitality, media, insurance, publishing, and retail—all of which increasingly make use of new mobile and social interaction technologies at the core of Connective Media research.

The hub's research and entrepreneurship will impact the following:

- the formation of new digital media and technology companies
- the education of students in technology fields
- collaborative advanced technology projects with companies in the industry

As evidence of the need for tech talent in these industries, Bob Jeffrey, CEO of JWT, a major advertising firm in the city, states "Specifically at JWT, I am confident we will be able to partner through your Connective Media hub through creating joint programs to reward our talent across the globe; to train our employees in emerging technologies; and of course to hire from your diverse and outstanding student body. Because of Cornell's excellence in tech related fields and because of your local knowledge, I feel you are the best school to accelerate innovation in technology and act as a catalyst to create new jobs and industries in the City."

Connective Media Featured Faculty

Claire Cardie: Reading our online emotions

The Internet may have been built to serve as an information highway, but our emotions often hitch a ride. Computer scientist Claire Cardie seeks to understand this "softer" side of the networked world. As a professor of Computer Science and Information Science, she leads a group of researchers who comb through online text for evidence of users' "opinions" – Cardie's catch-all term for our beliefs, judgments, and gut feelings - about issues, people, and goods and services.

Cardie is also a co-founder of Appinions, a New York City-based startup that monitors, gathers, and analyzes opinions across platforms. The company uses sophisticated computer algorithms to pick out subjective words, and gauge their power and meaning. Using a similar approach, Cardie and Cornell psychologist Jeff Hancock have developed software to spot "opinion spam" – fake online reviews of products or services planted by sellers to promote their own offerings at the expense of competitors. The methodology can also be used identify opinion-makers and chart networks of influence.

Unsurprisingly, Cardie's work has attracted many inquiries from manufacturers, public-relations firms, politicians, and others with a stake in understanding (and perhaps managing) public perceptions. News organizations have also expressed an interest: The Economist is already using Appinions' technology to power its Opinion Cloud, an interactive graphical representation of the public mood on various issues.

While Cardie's work has generated a lot of attention in the commercial world, she also sees it as a tool for federal, state, and local government agencies – a way to increase citizen participation in decision-making. Along with Cornell law professor Cynthia Farina and others, Cardie is developing the Cornell e-Rulemaking Initiative, which recently launched a pilot public-input platform, dubbed the Regulation Room, for the U.S. Department of Transportation.

Cardie envisions the tech campus not just as a research hub but also as a "showroom" and incubator space for connective-media startups that will invigorate industry, technology, and government. "We have an incredibly strong and broad-thinking faculty in engineering and related disciplines," she says. "It's a nice two-way street that no other place could provide."

Connective Media Featured Faculty

Michal Lipson: From electronics to optics

Michal Lipson, an associate professor of Electrical and Computing Engineering and a 2010 MacArthur Foundation "Genius" fellow, is one of the pioneers of the rarified world of nanophotonics. "I'm working now on ways to manipulate and control the flow of light in ways that nobody thought would be possible," she says.

In the quite foreseeable future, Lipson says, people will power their computers with photonics instead of electricity. Photonics will also be used to facilitate communication between devices without the need for satellites, cell towers, or other intermediaries. The advantages of the switch from electronics to optics are many, she says, including security, sustainability (optics use much less power than electronics), smaller size, and greater speed and accuracy.

Lipson's lab, which receives funding from Intel, the National Science Foundation, and the U.S. Air Force, among other sources, aims to develop an all-optical circuit on which both passive and active components can be integrated on a single chip. She and her team have already made remarkable advances with silicon photonic circuits in particular, performing tasks that have traditionally required electronics. Nearly all of the 14 patents secured by Lipson's lab have already been licensed to start-up companies.

Recently, Lipson has collaborated with fellow Cornell professor Antje Baeumner of the College of Agriculture and Life Sciences to develop an optical sensor that can detect a single bacteria in a sizable sample. This breakthrough has the potential to speed detection of antibiotic-resistant bacteria in hospitals and in patients, before the bacteria have a chance to multiply and spread.

Lipson, who is just 41, joined Cornell's faculty in 2001, after receiving her doctorate from MIT in Material Science. A graduate of the Technion - Israel Institute of Technology, she is a passionate supporter of Cornell's (and Technion's) plan for a New York City tech campus. "I would absolutely love for this to be a reality - I am crossing my fingers," Lipson says. "All the major industries interested in photonics are largely located in and near New York City— Verizon, banks, IBM, to name a few."

Hub-Centered Program

Healthier Life Hub

Human life expectancy in the United States has risen steadily for decades, mostly due to improvements in healthcare. However, historically the U.S. health care system has focused on advancing acute interventions and the treatment of disease. Comparatively little effort is placed on promoting healthier lifestyles, such as incorporating exercise into daily routines and controlling diet, as well as reducing or eliminating behaviors like smoking that increase risk for disease.

As a result, the U.S. far outpaces the world in terms of financial investment in health-related research through federal agencies and foundations, but ranks only 37th among the world's healthcare systems. Furthermore, the cost of our healthcare system is on an unsustainable exponential growth curve that, left unchecked, could jeopardize our entire economy. It is clear the U.S. can no longer afford to pour an ever-increasing fraction of the GDP into healthcare without potentially and irrevocably crippling the remainder of the U.S. economy.

Researchers at Cornell and the Technion believe technology has the potential to address both challenges, providing the means to simultaneously improve health and reduce cost.

With that goal in mind, the Healthier Life hub will focus on developing promising technologies that address issues driving healthcare costs up or quality of services down. Research activities in the Healthier Life hub fall under three broad themes:

- Technologies to promote healthier living

- Healthcare information systems

- Technologies to improve medical monitoring and diagnosis

Research Base

The faculty, researchers and students in the Healthier Life hub will be from Operations Research and Information Engineering, Electrical and Computer Engineering, Computer Science and Statistical science. While these disciplines form the technical core, faculty from the College of Human Ecology (Nutritional Sciences, Sloan Program in Health Administration) will also participate. Moreover, this hub will fully exploit the close proximity to the Weill Cornell Medical College and the affiliated New York-Presbyterian Hospital. Indeed, clinicians and staff at the large medical complex will guide the developing technology, and will be customers once the technology is developed. Examples of research that will be conducted under each of the three broad themes are given below.

Technologies to promote healthier living

Mobile devices such as a smart phone or tablet provide an immediate and effective means for identifying lifestyle patterns and for encouraging new choices that promote health while simultaneously allowing individuals to communicate back to their social network, including friends, support groups and possibly their physician. Below are three illustrations of how this technology could be used to promote healthier living.

Approximately 1 in 3 adults and 1 in 6 children are obese. Obesity is an important risk factor in heart disease and diabetes. For the most part, obesity can be traced to less desirable eating habits and food choices. Research by hub faculty on human judgment and decision-making uses fuzzy-trace theory to analyze risk perception and its relationship to decisions. Smart phone technology can gather data on those choices, but it also can be used to intervene. Individuals could receive "nudges" to eat a lower calorie meal, walk instead of riding the subway or taking a taxi, etc. Of course, these nudges must be calibrated by the individual's acceptance rate—and the software must adapt automatically.

The combination of social media, smart phones, and mobile device technology could provide the means for inexpensive support groups—led by health professionals—that would provide instant response and intervention. Users would range from the elderly experiencing social isolation or chronic pain to teenagers experimenting with risky behaviors. Technologies such as this would not only provide preventative healthcare but could potentially curb health expenses.

Smart phone technology provides an interesting opportunity to assist patients, particularly the elderly, with compliance with medication regimens. Patients could record when they have taken their medication and this could be incorporated into their records, allowing nurses to remotely monitor compliance.

This work involves collaborations among faculty from broad disciplines such as Psychology and Nutrition in addition to the traditional technical fields of Computer Science and Operations Research.

Healthcare information systems

Health care is in the process of an information technology revolution. Traditional medical record systems, typically paper based, have been fragmented and incomplete, accessing records has been difficult except on site, decision support tools have been limited, and mining data in records has been costly and cumbersome. The U.S. government has funded a program ($30 Billion HITECH Act of 2009) to promote the adoption and meaningful use of electronic health records (EHRs). While this could lead to huge benefits for the healthcare industry, there are a number of technical challenges that first must be overcome.

Transitioning to a fully electronic system has the underlying requirement that data be both reliable and secure. System trustworthiness is often portrayed as something whose presence is an enabler, but it might be more accurate to view its absence as a disabler. This is especially true for EHRs. Trends in computing compound the problem. For example, data of this scale is most efficiently stored centrally in a "cloud." However, the scale of these systems means technology that has worked in the past for fault-tolerance and security are no longer sufficient and new techniques must be developed. The system must be robust against natural events (power outages,

earthquakes and even trees falling on lines) and secure against attackers seeking to gain unauthorized access. We will conduct research to develop new computer systems (hardware and software) that address the needs for secure storage of EHRs.

EHRs could be a powerful tool for placing entire health histories, records of procedures, etc. at the fingertips of healthcare professionals. However, enabling the "right" information to be queried and retrieved effortlessly and quickly requires a deep understanding of the needs. The proximity to the Weill Cornell Medical Center provides a unique opportunity to gain insight and run trials on software tools as they are being developed. Indeed, this hub will partner with the Center for Healthcare Informatics and Policy, which focuses on end user needs. Hub researchers will direct their attention to the backend engineering challenges related to speed, security, reliability, portability and compatibility with other systems.

EHRs offer unprecedented opportunities for improving the public health. If data can be aggregated (anonymously), it can provide much richer information about regional trends in disease as well as the efficacy of various treatments. We assert that mining EHR data will improve the quality of delivered care. Moreover, if we introduce machine-learning techniques, we can develop tools that will assist the physician in diagnosis and treatment. However, classical approaches yield undesirable error rates. Recent work at the Technion on selective classification has demon-

strated nearly optimal performance is potentially achievable using a new mathematical notion of "hypothesis stability." The current implementation is computationally slow, but yields much lower diagnosis error rates. We will advance these techniques for diagnosis of cancer from microscopic biopsy images by applying different mathematical models. The tools could suggest new tests to be run to confirm the diagnosis. Pharmacological software tools then could suggest medications, while ensuring no conflicts with other prescriptions.

Technologies to improve medical monitoring and diagnosis

The proximity of the NYC Tech Campus to the Weill Cornell Medical College opens the door to rich and varied collaborations between the two campuses. In particular, biological research into the origins of disease, its diagnosis, and treatment are already underway at Weill Cornell and its affiliate hospitals. As a result there is a phenomenal opportunity to capitalize on these discoveries by incorporating the necessary technology to make them easy-to-use and reliable. This includes new technologies for remote monitoring of patients and diagnosis. Below are a few examples.

The first project involves the development of a wearable augmented-reality device for gait improvement in movement disorders patients. It provides auditory feedback of steps, and visual feedback in the form of an earth-stationary tiled floor responding dynamically to patient's own motion. It has been tested in numerous clinical studies conducted

Hub-Centered Program

at several medical centers in Israel and the U.S. on patients suffering from Parkinson's disease, multiple sclerosis, cerebral palsy, brain stroke and senile gait patients. It presently is in clinical trials with over 200 patients reporting significant improvement in their walking.

We will have a number of projects related to imaging of biological tissues through several cutting-edge technologies. Multiphoton microscopy, invented by Watt Webb at Cornell, can enable visual inspection of suspicious lesions through an endoscope in real time, with resolution of cellular detail comparable to a light microscope, obviating the need for a biopsy. This revolutionary development would allow safer procedures and eliminate unnecessary biopsies. Another project will use a new class of pixel (the "angle sensitive pixel" or ASP) that responds to both the intensity and incident angle of the light it detects, which would allow high-speed 3D imaging of tissues without traditional optics and at a very low cost ($5 optical camera). A third project will develop higher resolution magnetic resonance imaging (MRI) based on breakthrough CMOS technology that will enable hand-held devices that can image surfaces, such as the upper layer of teeth for cavities.

Education
In addition to the masters and doctorate programs described in the Tech Campus Educational Programs section, Cornell will offer a certificate program to train information technology professionals for working in the healthcare field. This program would build on the highly successful certificate program now jointly offered by Weill Cornell Medical College and Columbia University's Department of Biomedical Informatics.

Industry Connections
Research activities in the Healthier Life hub will impact a broad array of industries. Technologies for healthier living can be marketed directly to consumers. In addition, these technologies are perceived as game changers for the major insurance companies such as Aetna and UnitedHealth Group. "We believe in the integration of technology and the social sciences in developing new healthcare products and services while reducing costs for industries and consumers alike," Mark Bertolini, CEO of Aetna Insurance said. Similarly Tom Beauregard, executive vice president of UnitedHealth Group writes, "We have several concrete areas in healthcare decision support, consumer engagement models, medication safety, and physician solution tools where we believe work

can begin immediately to leverage our [UnitedHealth Group and Cornell] distinct assets in the New York City market."

Cornell also has strong ties to the medical care industry through Weill Cornell Medical College and the Center for Healthcare Informatics and Policy, especially with the EHR effort already underway. We envision the engineering campus will collaborate with CHIP enabling full products to be developed with the right interface for health care workers and the best engineering of the software for reliability and security. We anticipate that alpha and beta versions of the software will be tested early and often with physicians to "get it right."

Companies such as General Electric can serve as partners in the development of new medical technologies. "The proposed hubs align strongly with GE's products, expertise, and strategic priorities (such as ecomagination and healthymagination)," Mike Idelchik, vice president for Advanced Technologies, GE Global research said. "As the specific efforts within these areas are refined and mature, GE will explore collaborative connections with the CornellNYC Tech Campus, ranging from research to recruiting to philanthropy to commercial sales and beyond."

Healthier Life Featured Faculty

Rainu Kaushal: De-fragging health care

Rainu Kaushal is the founder and executive director of the Health Information Technology Evaluation Collaborative, or HITEC. Operating under the umbrella of a $250 million New York State program known as HEAL NY, HITEC is a consortium of state universities engaged in rigorous evaluation of an array of health IT initiatives.

Kaushal, a physician and associate professor of pediatric medicine and public health at Weill Cornell Medical College in Manhattan, views IT as a cornerstone of improved efficiency in healthcare. At WCMC, she heads the Division of Quality and Medical Informatics, and has assembled an extensive team of faculty, including health service researchers, biostatisticians, and public-policy analysts, to join in the division's reform efforts. "Whenever you're able to bring closely together collaborators from multiple disciplines, the chances of creating novel, productive, and marketable solutions goes up tremendously," she says.

Kaushal, a graduate of Harvard Medical School, also serves as director of pediatric quality and safety for the Phyllis and David Komansky Center for Children's Health at New York-Presbyterian Hospital. After completing her residency at Brigham and Women's Hospital and Children's Hospital Boston, she taught at Harvard and earned a master's degree in public health from the medical school.

Patients as well as providers can benefit from investments in health IT, according to Kaushal. Better information management, she says, holds the potential not only to reduce costs for hospitals and primary care doctors, but to encourage all of us to get more involved in our own care.

For Kaushal, the NYC Tech Campus represents a potential quantum leap forward in collaborative research among bioscientists, social scientists, and engineers. "Weill Cornell is one of the most outstanding medical colleges in the city," she says. "Cornell University has, by far, the top engineering [college] in the state and perhaps even in the country, and I think if you capitalize on the development of technologies up at Cornell, their expertise, and the expertise here [Weill Cornell], the capacity to be successful is huge."

Healthier Life Featured Faculty

Juan Hinestroza: Changing fiber properties through Nanoscience

An assistant professor in Cornell's College of Human Ecology, Juan Hinestroza leads a team of scientists whose research merges textile and fiber processing with nanoscale science to create new materials for clothing and medical supplies, among other applications.

In 2008, Hinestroza and Aaron Strickland of the College of Agriculture and Life Sciences founded iFyber to commercialize their joint work. It can be used to deposit nanocoatings (with nanoscale precision) on natural and synthetic fibers, changing their properties in valuable ways. They are currently working on a material capable of detecting leaks in chemical warfare suits (for the Air Force), and on novel antibacterial wound dressings and surgical sutures (for the Navy).

"The type of work we do is only possible at a place like Cornell," Hinestroza says, "where you have this unique merging of disciplines... where a fabric designer can interact easily with a chemist or a materials scientist."

Hinestroza's research has been covered by **CNN**, **Wired**, **ABC News**, and the **New York Times** (as well as **Nature Nanotechnology** and **Materials Today**). In addition to their scientific endeavors, Hinestroza and his researchers are involved in outreach efforts to increase minority-group participation in science, technology, engineering, and mathematics.

Hub-Centered Program

Built Environment Hub

If the current urban landscape is a product of a 20th century mindset of limitless consumption, the challenge of the 21st century will be to retrofit this landscape and make it truly sustainable. Currently the built environment represents 50 percent of the world's total energy consumption, but Cornell and Technion believe more efficient technologies can minimize that energy loss. By establishing a Built Environment hub at the Tech Campus, faculty and students will utilize research and technology to help make the vision of a more sustainable built environment a reality.

Touching on several components of the built environment—building design and operation, city planning, transportation systems, and energy and power systems—research will include: advanced graphical design of buildings; retrofitting and rebalancing of existing building stock; real-time monitoring of buildings, bridges, tunnels, and other infrastructure; monitoring and controlling transportation systems; and more. Subsequently, research and technologies developed by students will call for a new kind of engineering—one that integrates the various disciplines not only with one another but also links the engineering perspective with architectural design and urban planning.

This broader view is challenging for most universities; however, Cornell and the Technion have the interdisciplinary experience—evident in the collaborative functions of Cornell's David R. Atkinson Center for a Sustainable Future—intellectual resources, and vision to integrate these disciplines, making the Built Environment hub a unique and productive area for research and innovation.

Research Base

The Built Environment is a broad hub involving the traditional tech sector disciplines of Computer Science, Electrical and Computer Engineering, Information Science and Operations Research and Information Engineering, but also faculty and students from Art Architecture and Planning, Civil and Environmental Engineering and Mechanical and Aerospace Engineering. The breadth of this team will benefit from projects already underway that involve faculty from Architecture and Engineering.

We believe advances in smart technologies can transform the planning and operation of built systems in expected and unexpected ways. Our approach is best explained by the formula $E=MC^2$—where E represents the energy footprint of buildings, transportation systems, etc. in a sustainable world, M is measurement and the 2 Cs are communication and computation. Measurement refers to a new class of long-lasting, durable, and wireless sensors. Communication, most directly, refers to the challenge of monitoring the flow of human traffic—both pedestrian and vehicle—that calls for networks, data flow and synthesis of intelligent information at a scale presently unattainable.

Computation plays the broadest role in energy-saving technologies, especially in analytical tools that synthesize information from raw data streams. These tools must be coupled with visualization capabilities to gain true understanding of the data in order to make the most effective decisions. Computational advances also will make more sophisticated control of real-time monitoring translated into self-adapting systems possible. Furthermore, through wireless communication, the built environment can be managed, not just as a collection of independent buildings but also as the interdependent infrastructure required for a unit as small as a city block and as large as a neighborhood.

Research areas in the hub will include:

- advanced graphical design of buildings

- facility operations and management

- real-time monitoring

- retrofitting and rebalancing existing building stock

- transportation systems

Example 1: Advanced graphical design of buildings

This interdisciplinary research area will combine advanced computer graphics, architecture, and mechanical engineering expertise to develop new methods for simulating the built environment's energy behavior. Already hub researchers are working on developing techniques based on computer graphics algorithms to significantly decrease the computational time required for simulations of fluid flow and heat transfer. Ultimately, when the software is complete, it will help evaluate

building performance, significantly improving conservation measures. This interdisciplinary research team's work will play a role in the design of the NYC Tech Campus itself.

Example 2: Facility operations and management

The management of the built environment will be transformed by developments in sensors and actuators that provide superior monitoring capabilities. Not only does Cornell have the faculty expertise in this research area, it can also pull from its facility planning and management program—the first accredited higher-education program in this area. For a city such as New York, with its substantial healthcare and hotel industries, the potential for this targeted type of advanced infrastructure is particularly important.

Efficient lighting of the future will be designed around LED (light emitting diode) technology. Preliminary theoretical evaluations show that advanced lighting system design and its automatic control can cut down the total annual electricity use for lighting in classrooms by 50%-75%, and, in addition, reduce the energy demand for cooling in summer by 20%-25%. To verify the actual energy reductions and effects on building users, this project will conduct a combined theoretical and experimental research project in both a typical office building and a school, over the course of one year. Lighting control will include occupancy sensors, daylight-dependent control with continuous dimming, and daylight-dependent control with on-off dimming. Reference spaces,

without lighting control, will be monitored simultaneously. Lighting levels, user response and user satisfaction will be also be monitored.

Example 3: Real-time monitoring

Cornell's leadership in materials science and nanotechnology provides game-changing possibilities in sensor technologies. These technologies could help create a world where maintenance-free sensor networks monitor the environment affecting buildings, bridges, or tunnels.

Hub faculty members have pioneered ways to power these sensors. For example, one group has shown that a radioisotope powered, self-reciprocating cantilever can use ambient vibration as well as the kinetic energy from beta particles emitted from a thin layer of ^{63}Ni—a fuel with a half-life of 100 years—to power sensors that monitor a building's temperature, humidity, and other gases, and wirelessly communicate that information to a CPU. The CPU collects and interprets the data, making adjustments in the mechanical systems, reducing energy, and mitigating unwanted changes in the building's environment.

Another project involves advancing photovoltaic cells that hold the world record in energy efficiency. Using these cells, the group developed a manufacturing process for embedding organic heliostats in building surfaces that allow the surfaces to be actively controlled. This allows the reflectivity of the surface to be modified, so that external surfaces could reflect solar radiation on warm days and absorb solar radiation on cold days. The

research will focus on advancing the technology so that it is cost effective for building scale materials.

Example 4: Retrofitting and rebalancing existing building stock

Many industries will be transformed by the integration of smart technologies in the built environment. Foremost among these is the retrofitting of the existing building stock for energy efficiency. Nowhere is this more acute than in New York City, an urban center with one of the richest, oldest, and densest building stocks in the world. An integrated building retrofit can achieve changes in the building's thermal envelope, integrating daylight with artificial lighting, understanding the impact of neighboring buildings, finer scale control systems, and methods for predicting energy use based on usage patterns and weather predictions. The renovation of the Empire State Building is a well-publicized case in point. One of the biggest challenges for retrofitting is understanding and modeling the existing structure as well as its thermal envelope.

Using ideas similar to Google Maps with street view, combined with new sensor technology, it will be possible to collect information about the thermal envelope of the entire building stock in the city, not only its geometry, but thermal, absorption, and reflection properties. New sensors and new acquisition methods, including computation photography and smart mobile devices will allow this to occur. Combined with the energy simulation technologies described earlier, this technology will provide the tools for

Hub-Centered Program

optimizing the energy use and savings in existing environments.

Transportation systems

The next generation of vehicles will have an IP address on board, instantaneously providing the ability to network both public and private vehicles. Information gleaned can be leveraged to monitor and control traffic in congested cities; however, providing a seamless communication network to blanket cities such as New York calls for specific technical advances that will be developed on the NYC Tech Campus. The ultimate challenge will be to exploit the finer-grained, distributed usage data to improve transportation networks' centralized control.

Advanced travel information systems are designed to provide real time information enabling drivers to choose efficiently among routes to save travel time. Psychological research suggests that route-choice models can be improved by adding realistic behavioral assumptions. However, different choices arise when decisions are based on information compared to personal experience. In this project we investigate the combined effects of information and experience on route choice decisions in a simulated environment. These studies have implications for the design of navigation systems.

Education

In addition to the standard technical degrees, this hub will offer MS and PhD degrees in the College of Art, Architecture and Planning (Architecture, and City and Regional Planning) and Human Ecology (Design and

Environmental Analysis). Furthermore, students will be offered specialized interdisciplinary classes such as a two-course sequence on tools and techniques for energy simulation that will be jointly taught by Architecture, Mechanical and Aerospace Engineering, and Computer Science, along with a proposed design studio course on sustainable design. The course will take advantage of advanced building/energy simulation technology developed under this hub.

Industry Connections

We believe products from this hub will impact two huge industries in New York: architectural firms, many of which are headquartered in the city, and the construction industry, also a vibrant industry in the city. Computer aided design software that incorporates realistic engineering simulations immediately will be attractive to architects because it will give them a competitive advantage over firms that use the traditional two-step process. Tools developed to monitor and control traffic flow, and new Smart Grid technology will be attractive to both the public and private sectors. As stated in the GE support letter, "Already GE's Enterprise Program Team is in contact with the senior director of Cornell's Energy and Sustainability Department regarding Cornell's sustainable design [for the campus]. Areas under discussion include commercial support of renewable power generation, energy efficient buildings and the use of electric vehicle and Smart Grid infrastructure."

Future Hubs

As noted at the beginning of this section, the three hubs we have defined represent the initial configuration of the Tech Campus, but hubs are dynamic and hence they likely will change over time. New hubs may form while some older ones may end. The combined depth of Cornell and the Technion will provide a rich resource of faculty and student expertise that will accommodate these transformations regardless of the directions the campus moves. An example of a potential future hub would be "Fashion and Textiles". This hub connects to one of the dominant industries in New York City, the fashion industry. Cornell's Fiber Science and Apparel Design department has deep expertise on textiles and fiber manufacturing technologies, as well as research into high-tech apparel that incorporates nanotechnology to bring remarkable new function to clothing (e.g., health-monitoring apparel). A second example of a potential future hub is "Food and Nutrition", which leverages our leadership in research, teaching and outreach in the College of Agriculture and Life Sciences. This hub will connect to the large food retail and restaurant businesses in the city. Cornell's extension programs are already active in the city, and this hub will bring research on a broad range of new technologies related to, for example, advanced food monitoring and safety.

Built Environment Featured Faculty

Don Greenberg: The expanding universe of computer graphics

For more than four decades, Don Greenberg has been a powerhouse of creative energy in the world of computer graphics.

On Cornell's Ithaca campus, Greenberg teaches all over the place — in the College of Engineering, the College of Architecture, Art, and Planning, and the Johnson Graduate School of Management, too. His CV is equally wide-ranging: over the years, Greenberg has led and guided efforts to (among other things) build tools for medical imaging and virtual surgery, develop "electronic paper" screens and touch-sensitive tablets, and plot the topography of the moon.

In addition to his role in creating and running Cornell's Computer-Aided Design Instructional Facility, Greenberg founded the Science and Technology Center for Computer Graphics and Scientific Visualization — a five-university consortium that includes Brown University, the California Institute of Technology, the University of North Carolina, and the University of Utah.

At Cornell, his former students have gone on to professorships at the finest universities, to creative roles at leading design and architecture firms, and to executive jobs at such high-profile companies as Autodesk, Dreamworks, Pixar, and Sony Pictures Imageworks. Six of Greenberg's students have received Academy Awards for technical accomplishment, and five have garnered the much-coveted ACM SIGGRAPH Award, as has Greenberg himself.

All that is in addition to his substantial work in the field of sustainable architecture and mechanical engineering – a cause he continues to advance in trailblazing plans for the NYC Tech Campus. Greenberg, the Jacob Gould Schurman Professor of Computer Graphics, is especially excited nowadays about the use of 3-D simulation as a design tool for buildings that will have a symbiotic relationship with their surroundings, reducing energy consumption as well as environmental harm. He predicts that 3-D simulation will soon be used to retrofit and improve existing structures, signaling a boom for city-based architectural, engineering, and construction businesses.

With Kevin Pratt, ground-breaking architect and assistant professor at Cornell, Greenberg shares a vision of the NYC Tech Campus as its own ecosystem - a symbol and working model for sustainable built environments based on cutting-edge technology.

Built Environment Featured Faculty

Kevin Pratt: Simulate first, design and build second

Kevin Pratt, assistant professor in the College of Architecture, Art, and Planning, has his sights set on the next generation of building simulation tools. With funding from the Department of Energy, Pratt and his researchers are working on ways to use parametric simulation to manipulate an imagined structure's shape, materials, and window arrangement, etc., generating accurate estimates of energy use for many permutations of design and engineering choices.

Up to now, Pratt says, simulation has largely been used by mechanical engineers to optimize the mechanical systems of buildings whose architecture has already been determined. Sustainable construction demands interdisciplinary collaboration in order to "push simulation early into the design process," he says.

With another team of interdisciplinary researchers, Pratt is trying to construct a device capable of generating energy from slight wind vibrations. While engineers build the power electronics and oscillators, Pratt and his architecture students look for ways to change wind flow through architecture, and then to incorporate the technology into building design.

"Using smart technologies," Pratt says, "we'll be able to have a built environment that's aware of its uses of resources and manages them in an optimal fashion."

As a graduate of Columbia University and a longtime architecture critic for Time Out New York and Artforum, Pratt is well-connected in New York City's architectural and engineering communities. He looks upon the city as a hugely promising test bed for methods of making buildings more sustainable by retrofitting their infrastructure.

"Once you understand simulation, computation, and how to drive their power into the built environment, there's an opportunity for that expertise to propagate," says Pratt. "New York City is a place where intelligence is applied to problems in specific ways."

"The real question," he says, "is how we take all the data we're now able to generate, turn it into information, and use that information in a way that enables us to manage resources and make good decisions. I think management of data and resources is going to be that critical piece of the built environment in the 21st century. And New York City is well-positioned to be a leader in that, exporting intelligence to the world."

Educational Programs

The main goals of the educational programs at the NYC Tech Campus are to attract the best students from around the world in technology-related fields, give them the top quality education and practical experience that Cornell and the Technion are famous for, and tie them deeply to the entrepreneurial and business communities in New York City so that they remain in the city upon graduation.

At the heart of our plans for the NYC Tech Campus is an innovative educational program that, like all other aspects of this plan, is focused on achieving the core mission of this campus, which is to generate economic development by enhancing the burgeoning tech sector of the city. In interviews with over 200 venture capitalists and entrepreneurs in the city, one message has been clear; New York does not have enough technical talent – at both the individual contributor and the management levels – to accommodate its needs. If the city is to grow this sector, those needs also will grow. Thus, a fundamental mission of the Tech Campus is to produce students that can enter the workforce across the entire tech ecosystem (from startups to large companies).

We propose an innovative new curriculum with rigorous courses in the relevant technical fields that have the same depth as those offered on the main campuses, but with additional requirements for entrepreneurship and business courses, and for industry projects. Entrepreneurship is largely learned by doing, and thus the programs include a substantial hands-on component, where students will work with seasoned entrepreneurs and early stage investors in the city through the Mentor Program described below. To allow students time for these hands-on experiences, whenever possible, we will restrict formal course lectures to four days (Mondays through Thursdays) so that students have a full day during the work week as well as other times to work on projects and interact with industry. We believe this practical experience will distinguish this program and prepare students to be leaders in tech fields, while at the same time teaching them the technical and analytic skills that make Cornell and Technion graduates so well respected.

The academic programs planned for this campus will be full-time study. Full-time programs attract the very best technology students from around the world. In that way, the educational programs on the NYC Tech Campus will be additive and not duplicative or competitive with existing technology education programs in the city, as we will be competing for students from a global, rather than a local pool.

Below we describe the degrees that we plan to offer on the NYC Tech Campus. Note that degrees will require accreditation through the New York State Department of Education, as discussed below.

Technion-Cornell Innovation Institute Master of Applied Science Degree

Technion and Cornell will seek accreditation for a novel new degree, the professional Master of Applied Science (MASc). Students in this program will experience an academic curriculum containing a unique applied component, involving close interaction with industry and some background in entrepreneurship and management.

By maintaining a unique (but flexible) MASc program, training students at the cutting edge of their hub industry, as well as structured technology transfer platforms that will encourage an entrepreneurial R&D culture leading to local company formation, TCII will turn into a powerful two-sided magnet. The

Alumni Affirmations
Alok S. Tayi '06

Materials Science & Engineering
College of Engineering
PhD Candidate, Department of Materials Science
& Engineering at Northwestern University
Co-founder, Chief Technologist of PreScouter, LLC

"Based on my experience in developing innovation tools & products for Fortune 500 companies, firms are motivated to accomplish two things: 1) Innovation and 2) Seeking out privileged (non-public) information. Cornell can leverage their existing alumni and corporate relationships to develop a cadre of corporate members who serve as mentors, sponsors, and customers for startups. In exchange for their participation, corporations can be given first-look access to CU startups & discoveries poised for scaling and commercialization."

former will attract established companies, whose core IP was generated elsewhere, to a source of quality manpower, whereas the latter will encourage the development of local industry (i.e. start-ups) based on IP generated at the TCII. In the long run, these start-ups will evolve into larger companies located off campus, with an innovation center affiliated with TCII.

The Industrial Project is a significant part of the study program. This is an applied research and/or development project performed under the joint supervision of an institute faculty member and a senior professional (typically an engineer) from one of the affiliated companies. The project topic may originate from the company, where the objective is to develop a proof-of-concept or prototype product related to the company business, or from either the student or the faculty member, in which case it will usually be endorsed by an affiliated company. The project deliverables will include a concrete first implementation of the idea, all the necessary documentation, a frontal presentation of the results and a written business plan describing how the project can be commercialized. Three quarters of the project time will be dedicated to technological R&D, and one quarter of the project time will be dedicated to exploring the commercialization aspects and preparation of a complete business plan, under the supervision of an appropriate business-oriented faculty member. On completion, the project may enter the institute's technology transfer track and be spun-off on a competitive basis if the development is deemed sufficiently successful.

Technion-Cornell Innovation Institute Doctoral Degree

Any graduate of the MASc program may apply for admission to the PhD program at either Technion or Cornell, where suitable exemptions will be given (mostly in coursework) in lieu of the acquired MASc degree. We envision that some of the applicants would continue to perform more basic scientific research to further develop the ideas and technologies present in their industrial project. This will typically be under the supervision of the institute faculty member who previously supervised the project. The PhD student may optionally spend some time (a semester or two) at either Technion or at Cornell in order to

better access relevant faculty members or laboratories.

Cornell Master's Degrees

Cornell University will offer discipline-based Master of Engineering (MEng) and Master of Professional Studies (MPS) degrees in core tech areas such as Computer Science (CS), Electrical and Computer Engineering (ECE), Information Science (IS), and Operations Research and Information Engineering (ORIE). These degrees will follow the Ithaca campus requirements, including 30 credits of classes of which at least 24 are advanced technical or business courses and 6 are a technical project. Advanced technical courses at or above the 4000 level (senior level undergraduate or graduate) are required in the chosen field or related fields. The existing program is generally 2 semesters in residence. The planned MEng degree in NYC will be offered in both 2 and 3 semester versions, depending on the degree of preparation of the student and the extent to which they delve deeply into a commercial domain. For all of the core technical courses we expect to offer sections of the courses locally in New York City, in order to take advantage of the ability to integrate real world problems into the technical material by incorporating staff into team teaching with faculty. The NYC MEng or MPS will require 6 project credits, where the project must be co-supervised by someone from the Cornell Mentorship Program. The goal of the project is to engage students on real problems early in the program, and keep them engaged throughout their studies.

The real world experience will be supplemented with required intensive business and entrepreneurship courses that will be offered both during the semester and in January when regular classes are not in session. These courses will be taught by faculty from Cornell's Johnson Graduate School of Management, with extensive involvement of local entrepreneurs and business people. The business and entrepreneurship courses will be modeled on highly successful classes already developed at Cornell, such as Entrepreneurship for Scientists and Engineers that combines lectures and textbook material with practical experience creating and pitching a business plan. A key aspect of the program is to expose students to commercial and entrepreneurial

NYC's Tech Ecosystem
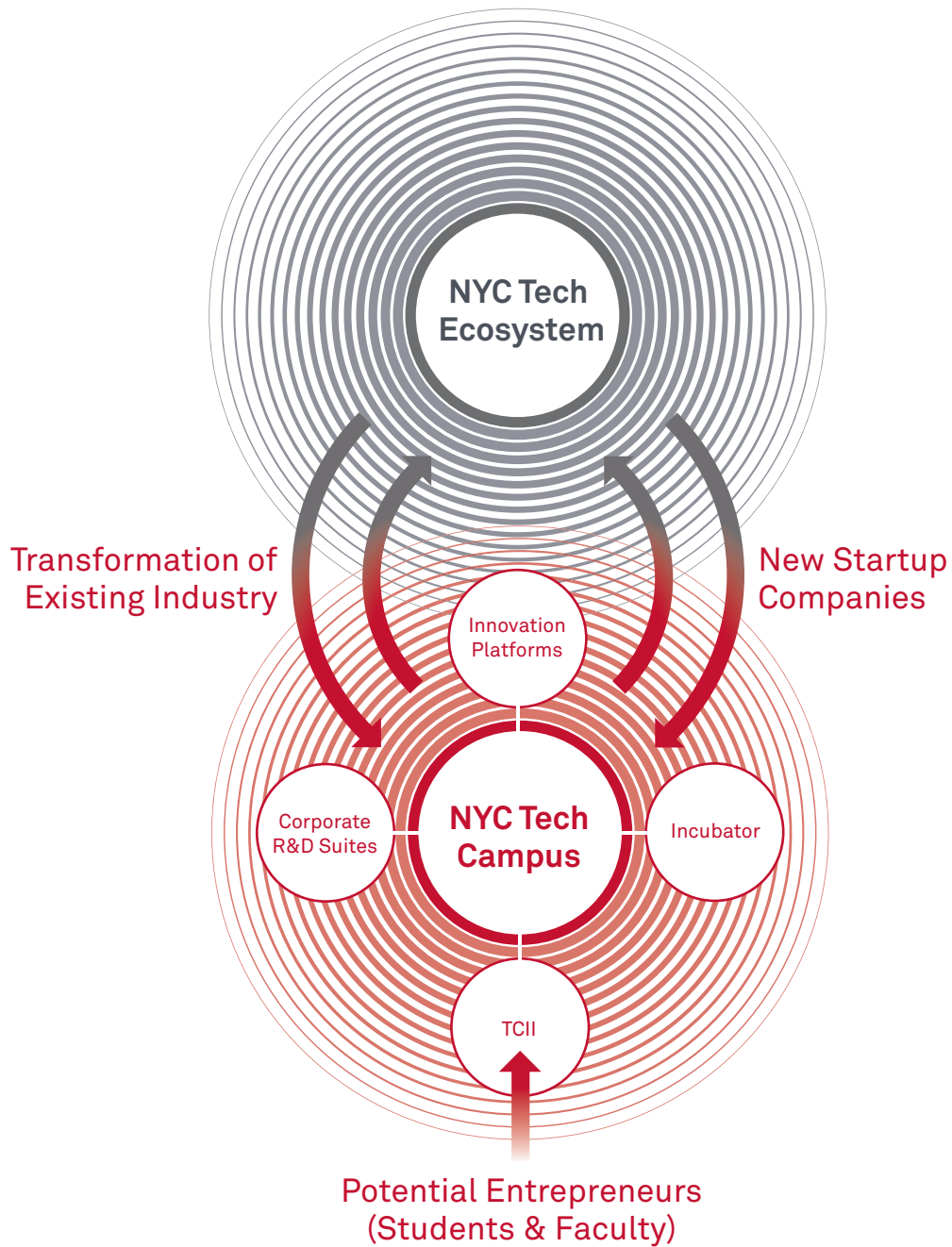
activities early on, and do so with companies and mentors in NYC, so that they become tied into the local business network and thus are more likely to create new businesses or help fill the need for technical talent in the city.

Mentorship Program

Hands-on experience and networking provides invaluable and useful information for budding entrepreneurs. However, building a trustworthy relationship with a knowledge-able mentor gives entrepreneurs timeless wisdom and the free advice they need to help navigate his or her business experience. That is why at the NYC Tech campus, the mentorship program is of the upmost importance.

Drawing on the strengths of Cornell's large alumni network, the campus' mentoring program will utilize approximately 4,700 Cornell alumni who will build relationships and share wisdom with students navigating entrepreneurial waters.

Cornell Joint Accelerated Master of Engineering/Master of Business Administration Degree

Cornell will offer a new joint MEng/MBA degree that students will complete in two academic years plus two summers. Students enter the program in the first summer by taking approximately 20 credits of core business classes. Over the next two years, students will complete 25 credits of additional business and entrepreneurship classes as well as 30 credits of engineering classes. The coursework prepares students to run and join startups. It also allows students to develop their own business while pursuing the dual degree. Students will be encouraged to work in small teams as founders of these businesses. They will have access to the Mentorship Program. Students also will complete credit-yielding internships with participating tech business partners in the city.

Cornell Doctorate Degree

The doctoral programs at the NYC Tech Campus will largely focus around research taking place in the hubs. While students will fulfill the course and thesis requirements for a degree in some technical discipline, their thesis work will fall under the rubric of one of the hubs, and their thesis committee will consist of faculty that span multiple disciplines within that hub. This interdisciplinary research focuses on commercially-oriented problems will serve to distinguish the PhD's earned at the Tech Campus from those earned in Ithaca. In most of Cornell's doctoral programs, the core course requirements are fulfilled in the first two years, and then students spend approximately three additional years on research and graduate seminars. The NYC Tech Campus will offer graduate courses that complement the course offerings in Ithaca, enriching the course opportunities for students on both campuses. Students completing a PhD on either campus may alternate their time between the two campuses, depending on their course and research interests.

Cornell Undergraduate Students

While the main educational focus of the proposed campus is at the graduate level, there will also be undergraduate summer and semester programs, but not undergraduate degrees. These programs will be aimed at juniors and seniors who seek some hands-on entrepreneurial experience. Students will come during the summer before their junior or senior year to intern with one of our affiliated startup companies. Students will be paid by the company, but will also participate in a 1-credit evening class that meets once a week to hear lectures from local entrepreneurs. Alternatively, students could use the Co-op program in the college that allows them to spend the fall semester of their junior year and summer before their senior year to work

with a company. During the summer session these students would also take the 1-credit class. Either way students will gain invaluable experience while continuing to progress towards their degree.

Entrepreneurship and Innovation

With an emphasis on technology-innovation and commercialization, each hub will have connections to an Entrepreneurship and Innovation curriculum. The coursework will cover all aspects of innovation and commercialization and allow students to study companies, learn how to identify a market, leverage resources and get their startups off the ground. Students will be able to choose from a variety of classes from finance, marketing and management to product design, development and human resources. In addition to related coursework, students will be able to take advantage of Cornell connections, educational seminars, entrepreneurs in-residence, legal and financial services and the campus' business incubator. Services offered on the Ithaca campus include: Big Red Startup Suite, Law Firm Partnerships, Cornell Entrepreneur Network (CEN) and Business Incubator. Detailed descriptions of these programs are given in Section 1.08.

Accreditation

Applications for all degrees currently not accredited in New York State, including the TCII MASc and PhD degrees will be submitted to the New York State Department of Education as soon as Cornell and Technion are chosen for the NYC Tech Campus.

Relationship to Main Campuses

The NYC Tech Campus is not a branch or satellite campus of Cornell or the Technion, but a whole new, self-sustaining, vibrant campus that will be connected intellectually with the main campuses, yet will have a distinct and complementary mission, namely

enhancing economic development in New York City by graduating students who are committed and ready to enter the burgeoning tech sector.

As noted above, the unique mission of the campus motivates us to organize it around hubs instead of traditional departments. This will enable interdisciplinary teams with the necessary skills to come together to develop new technologies, business plans, and ultimately companies that will compete for their place in this tech ecosystem.

The distinct mission of the NYC Tech Campus from those of its parents means the campuses will not be competitive, but complementary. This is particularly important for Cornell due to its proximity. A prospective student will be able to decide whether to apply to Cornell in Ithaca or NYC based on their interest in entrepreneurship and commercial activity. The same will hold for prospective faculty candidates. We expect most faculty will choose a primary appointment on one of the two campuses; however, some faculty, whose research advances long-term foundations while still having the potential for immediate commercial impact, may have joint appointments and laboratories on both campuses. The unique opportunities this combination of campuses would provide researchers and students will transform Cornell into a unique university in the world.

All faculty on the NYC Tech Campus will be appointed to Cornell, the Technion or TCII, and their tenure home will be at Cornell or the Technion. The boundaries for the campuses will be porous and we anticipate the free exchange of students and faculty among the three campuses.

Faculty Hiring Plan

The NYC Tech Campus will open its doors in Fall 2012 in leased space. At this stage, virtually all

of the faculty and most of the students will be from the Ithaca campus. This is required in the early years to bootstrap the campus to its critical mass. One of the key functions of the Ithaca faculty on the new campus will be hiring of new faculty. It is our belief that an outstanding faculty attracts outstanding applicants, and so it is crucial that we engage our Ithaca-based faculty in the hiring process to ensure quality hiring of outstanding individuals during this initial delicate stage. Our current plan calls for 10 Ithaca faculty to start the NYC Tech Campus. As the Tech campus faculty grows, some of these early initiators are expected to return to Ithaca. Note these Ithaca faculty are not included in the projection numbers.

A key goal of this hiring will be to attract a diverse faculty with high representation of women, underrepresented minorities (URM) and international faculty. It is viewed as critical that this campus reflects the diversity of New York City. The College of Engineering on the Ithaca campus created the Strategic Oversight Committee (SOC) to monitor all searches in the college to ensure they all engage in active search processes that have been proven effective at ensuring a diverse pool of applicants. We will institute something similar for the NYC Tech campus and use it to share best practices, monitor and ensure rigorous search procedures are applied uniformly across all searches.

Population Projections and Research Expenditures
The table below shows projections for the faculty, staff and students, and projections for the research expenditures in each of the three phases.

Development

Building and Land Development
The NYC Tech Campus will be a vibrant mixed-use campus, growing to an estimated 2.1 million square feet at full build. The campus

Population Projections

Phase	1	2	3	Full Build
Opens in	FY 2018	FY 2028	FY 2038	FY 2043
Leadership				
Leadership sub-total	2	3	3	3
Staff				
Administration	31	64	98	102
Programs, student services, etc.	19	24	29	29
Staff sub-total	50	88	127	131
Faculty, Researchers, Post-Docs				
Tenure track faculty	27	68	108	128
Research faculty	25	65	105	125
Visitors/adjuncts (total fte)	15	26	33	33
Postdocs	12	61	103	125
Corporate-funded researchers	5	65	105	125
Academics sub-total	84	285	454	536
Graduate Students				
PhDs	90	355	605	730
Dual degree (MBA/Meng)	40	120	120	120
Meng	160	420	820	1,020
Enrollment sub-total	290	895	1,545	1,870
Total Cornell NYC FTEs	**426**	**1,271**	**2,129**	**2,540**
Planned Research Expenditures (000s)	$13,500	$38,475	$65,475	$81,675

will be anchored by more than 1.1 million square feet of space for academic uses including teaching, research, business start-ups, and corporate co-location space for Cornell , The Technion and academic and business partners. The facility will include exhibit and interactive space, cafés, and other amenities that will invite the public in and foster collaboration among faculty, students, investors, corporate partners, and visiting researchers.

A variety of support uses—residences for graduate students, faculty, and staff, a conference center, and other public spaces— will further animate the campus, establishing the NYC Tech Campus as a 24/7 community for learning, living, and innovation.

Upon designation as New York City's institutional partner for the Applied Sciences Initiative, the NYC Tech Campus will rapidly begin operation, opening an off-site location in 2012. Cornell anticipates opening in leased space and enrolling the first PhD students in the fall of 2012. Also present in Fall 2012 will be Ithaca-based undergrad and master degree students working in NYC on projects and internships, and attending entrepreneurship workshops and events. The campus will expand to 40,000 square feet in the fall of 2014 to accommodate the first class of NYC-based master's degree students. By the time the campus relocates to Roosevelt Island, nearly 300 students will be enrolled and Cornell will employ nearly 130 researchers, faculty, and staff.

Architectural Program Overview

Academic and Research Space: 620,000 SF
At full build, the NYC Tech Campus will have 620,000 square feet of academic and research space. This space will accommodate classrooms, faculty offices, research space for faculty and scientists, and ample space for commercialization activities, from student projects to corporate-sponsored research.

There will be ancillary space for exhibits, interactive and social gatherings, cafés, and other amenities as well as meeting space for the adjacent conference center.

Academic Facilities: 552,500 SF
Research labs. Includes dry labs for faculty and researchers as well as space that may be leased or used for corporate-sponsored research.

Faculty offices. Office space will be a mix of private and open-plan configurations. Tenure-track faculty will receive private offices, while researchers' and postdocs' offices may be co-located with their labs or available in common workspaces.

Classrooms/conference center. Core teaching space includes tiered classrooms, lecture halls, seminar rooms, auditoria, meeting rooms, and breakout spaces. These spaces will be used for teaching and will also be available for public conferences.

Exhibit/interactive/lounge/café space. The academic/research facilities will accommodate spaces designed to foster collaboration, communication, and public engagement. This

Preferred Phasing Plan: Cumulative
Gross Square-Feet

Phase	1a - Off-Site		1B	1C	2	3
Opens in	2012	2014	2017	2020	2027	2037
Academic:	20,000	40,000	150,000	200,000	385,000	620,000
Corporate Co-Location:	–	–	–	100,000	300,000	500,000
Subtotal:	20,000	40,000	150,000	300,000	685,000	1,120,000
Housing:	–	–	300,000	300,000	550,000	800,000
Conference Center:	–	–	100,000	100,000	100,000	100,000
Subtotal:	–	–	400,000	400,000	650,000	900,000
Total NYC Tech Campus:	**20,000**	**40,000**	**550,000**	**700,000**	**1,335,000**	**2,020,000**
9–12 School:	–	–	80,000	80,000	80,000	80,000
Grand Total:	**20,000**	**40,000**	**630,000**	**780,000**	**1,415,000**	**2,100,000**

will be a dynamic space in which faculty, students, venture capitalists, and corporate partners can intermingle. The public will be welcomed in with exhibits and interactive displays.

Commercialization Space: 67,500 SF
Incubator space. The Tech Campus' students and faculty will have access to an incubator with services and facilities needed to support start-up businesses.

Accelerator space. We intend to partner with local accelerators, such as Dreamit, TechStars or Betaworks, to operate an accelerator facility for entrepreneurs.

Demonstration space. Space will be provided for venture capitalists, corporate partners, faculty, and students to come together to view and discuss new business and products.

Corporate research space. We will house corporate-sponsored research and/or lease space to companies wishing to collaborate with the NYC Tech Campus faculty.

Corporate Partner Co-Location Space: 500,000 SF
As the NYC Tech Campus grows, forward thinking companies will want to take advantage of access to our faculty, researchers, and students. Cornell and Technion see enormous value in accommodating a "mini research park" on campus that will house such companies.

To help execute this vision of the NYC Tech Campus, we have begun a conversation with Wexford Science+Technology, a well-respected developer of life sciences and technology-related facilities and research parks, to discuss its potential interest in collaborating with us. A letter of interest from Wexford, detailing its qualifications and potential role in developing space for companies seeking to co-locate with Cornell is provided electronically.

During an initial planning phase, Wexford will provide important advice and guidance about the optimal size and type of co-location facilities—which industry segments should be targeted given Cornell's academic and research initiatives, and the lease terms prospective tenants will require. Corporate co-location space will be developed as soon

as sufficient demand exists. As developer, Wexford will be responsible for outreach to prospective tenants, design, financing, construction, and operation of the space.

For purposes of conservative modeling, we have assumed that the first 100,000 square feet of corporate partner co-location space will be developed toward the end of Phase 1 ("Phase 1C"), anchored by 50,000 square feet of academic space to be leased by Cornell. The space will open in 2020. Additional increments of 200,000 square feet will be developed in Phases 2 and 3, respectively.

Residences for Graduate Students, Faculty, and Staff: 800,000 SF
At full build, the NYC Tech Campus will accommodate more than 2,500 full-time equivalent affiliates. It is anticipated that a significant percentage of tenure-track and research faculty, postdocs, and graduate students, including PhD candidates and Master Degree students will require housing. We propose to build up to 800,000 square feet of housing at the Tech Campus.

Providing reasonably priced housing is an essential ingredient for a successful campus. Part of the appeal of the Roosevelt Island site is that it offers opportunities elsewhere on the island to accommodate housing off campus, yet close by. We could potentially satisfy some housing demand in the existing rental buildings on Roosevelt Island as well as the remaining three residential development sites that, together, can accommodate around 800 new units. Thus, if we need more space for academic and research uses, or if demand for corporate partnership space exceeds 500,000 square feet, we could reduce our housing program to facilitate these new opportunities to expand research and teaching space, collaborate with corporate partners, or otherwise support our core mission.

In addition, although we project housing demand of 953,000 square feet at full build, we propose to build only for demand as of the opening of Phase 3, in order to preserve more space for academic and research uses.

For modeling purposes, the projected 800,000 square feet of housing on the NYC Tech Campus includes almost 400 units for faculty and postdocs, and approximately 670 units

for graduate students in a mix of studios, one-bedroom, and two-bedroom apartments. Since the graduate student units are designed to be shared, the estimated bed capacity is 1,281.

We are working with two potential partners on the design, development, and financing of our Phase 1 housing program – Hudson/Related, a joint venture of The Hudson Companies, Inc. and The Related Companies, L.P., and Capstone, a national developer specializing in student housing. Based on site visits and numerous meetings with Cornell, both developers have provided proposals and financial analyses that evidence the basic feasibility of developing student, faculty, and staff housing on the NYC Tech Campus-and private sector interest in building it.

Detailed information about both of these potential development partners, including company descriptions, letters of interest, term sheets and development proposals submitted to Cornell, are provided electronically.

Upon designation as New York City's institutional partner for the Applied Sciences Initiative, Cornell will move rapidly to select a housing development partner and enter into more thorough and definitive development agreements.

Conference Center: 100,000 SF
We believe a lively conference center is critical to the success of our campus and its mission. It will accommodate meetings, events, and conferences arising from the Tech Campus' academic programs and commercialization activities, and attract visitors, workshop attendees and others who have important business on the campus.

To plan development of the proposed facility, we enlisted prominent alumni of Cornell's top-ranked School of Hotel Administration for

advice and engaged HVS Consulting and Valuation Services, led by alumnus Steven Rushmore, to prepare a market feasibility study, brand recommendations, and financial projections for the proposed facility. HVS recommends a conference center positioned as an upscale, limited-service facility with in-house meeting rooms and food and beverage space. Many of the meeting rooms will be located in the adjacent academic/ research building. A copy of the HVS report is provided electronically.

To identify potential partners interested in financing, developing, owning, and operating the conference center, Cornell prepared a Request for Expressions of Interest, which was sent to approximately two dozen developers and investors recommended by HVS, as well as to prominent Cornell alumni. We received proposals from a number of development teams and hotel operators interested in executing the university's vision for the conference center. Proposals submitted by the top two candidates, Starwood Hotels/Extell Development and Thompson Hotels/ Pomeranc Group are provided electronically.

Cornell received additional proposals from hotel operators, including Dolce Hotels and Resorts and the Pyramid Hotel Group, both of which have significant experience in operating conference center facilities for academic institutions. Upon designation, Cornell will work with HVS and these respondents to refine their proposals, select the best development and operating partner, and enter into definitive agreements.

Public High School (Optional): 80,000 SF
As discussed in more detail in Section 3.03, Relationship to Surrounding Community, we are exploring the possibility of working with an education partner to develop a proposal for a new public high school. The school, open to all,

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Faculty Profile
Seffi Naor

Smart pricing

Ever had to make a decision with inadequate information? Merchants are put in this position all the time, when deciding, for example, which customers to serve and what price to charge. Doing business with the person prepared to pay the most may sound like the best policy. but it doesn't always yield the best results, according to Seffi Naor, a professor of computer science (and expert in online algorithms and algorithmic game theory) at the Technion – Israel Institute of Technology.

The same conundrum applies to online advertising sales driven by public auction of search words. Advertisers with divergent budgets often compete for space on a site by offering widely varying amounts of money for the same set of desirable key words. Naor and his colleagues have built

would accommodate an estimated 450 children in grades 9–12, offering a career and technical education pathway, as well as a curriculum suitable for college-bound students. It is anticipated that the school's curriculum would be based on NYC Tech Campus' program hubs, translated to age-appropriate learning experiences and outcomes for high school students. Our faculty will serve as a rich resource for the school, while graduate students may offer homework assistance, supervise student projects, and sponsor technology competitions. Our corporate partners will provide internships and other practical, hands-on experience. The learning environment envisioned for the high school will be in many ways a microcosm of the interdisciplinary, research-based approach of the NYC Tech Campus.

Assuming the Department of Education believes a high school aligned with the Tech Campus is of value, upon designation for the Applied Sciences campus, we will select an education partner and begin planning in earnest to launch selected initiatives. Whether the school is located on campus or elsewhere, its relationship to the NYC Tech Campus will enable students to experience a college campus environment and enjoy access to the campus' faculty, students, labs, equipment, and educational facilities. Letters of interest from potential education partners appear in the Appendix.

Development Plan

Phase 1

Upon designation by the city, our intention is to work closely with the city to accelerate the design and public approvals process in order to be ready to begin construction when the Health and Hospitals Corporation vacates Goldwater Hospital at the end of 2013.

Cornell's ideal project phasing approach is to develop the critical mass of built space early. Our aggressive timetable has taken the following objectives into account:

- Develop academic space as quickly and aggressively as possible to ensure maximimum programmatic impact immediately

- Include appropriate additional space to ensure maximum interaction with the tech community and necessary auxiliary functions such as housing

- Meet EDC requirements to achieve a minimum of 50 percent academic and research uses by the completion of Phase 2 With the city's support, an accelerated design and public approvals process for the NYC Tech Campus will help the university follow this timeline, allowing construction to commence at the beginning of 2014. The final product—a vibrant, state-of-the-art campus—will produce tech sector jobs by creating an influx of creative technologies and companies.

Preferred Phasing Plan

With these goals in mind, our ideal Phase 1 program includes two sub-phases. For Phase 1A, we anticipate leasing an initial 20,000 square-feet in the city by Fall 2012. This space will grow to 40,000 square-feet by Fall 2014. Phase 1B includes building a 150,000 square-foot academic and research facility, 300,000 square-feet of residence space, and a 100,000 square-foot conference center. The total of built space will equal 550,000 square-feet at the end of the phase.

If the New York City Department of Education is supportive, Cornell also proposes the construction of an 80,000 square-foot public high school for grades 9–12, bringing total Phase 1B development to 630,000 SF.

"greedy but smart" algorithms that help site owners reach the most optimal solution. According to Naor's research, the wisest course, often, is to turn down the highest bidder in favor of the advertiser who demonstrates the best balance between his remaining budget and the price he is ready to pay. Naor's team has also successfully addressed – algorithmically – the problem of "frequency capping," in which an ad loses its effectiveness over time.

Naor's work is a standout example of theoretical research with practical applications. "A mathematical solution is the starting point, not the end point," he explains. "The real world is more complex than the assumptions on which a mathematical model is based, but algorithms can be expanded to cope with the complexity required for practical use."

In Phase 1C, which would open in the fall of 2020, Cornell proposes to work with Wexford Science + Technology or a similar developer to build an additional 150,000 SF of academic and research space, primarily for corporations wishing to co-locate with the Technion-Cornell Innovation Institute. Cornell will lease 50,000 square feet to anchor the building. Depending on demand, the building could be larger or open earlier.

By the time the new Tech Campus opens on Roosevelt Island in 2017, it will have more than 80 faculty and researchers, and 50 staff. Approximately 290 students will move to or be enrolled at the new campus, including 90 PhD candidates and 200 students pursuing master degrees.

Phase 2
After Phase 1 is complete, Cornell will launch Phase 2. This phase includes development of an additional 635,000 square feet, including 185,000 square feet of academic and research space with the supporting amenities. We are working with third parties to develop 200,000 square feet of corporate colocation space and 250,000 square feet of housing.

Phase 2 of the Campus will open in the summer of 2027, and bring the cumulative amount of space for teaching and research—both academic and corporate—to 1,335,000 square feet. Within this space, approximately 285 faculty and researchers, and 355 PhD students and 540 students pursuing master degrees will learn, research, and create.

Phase 3 - Full Build
The third and final phase will open in the summer of 2037. At that time the Campus will have added 235,000 square feet of academic and research space, as well as another 250,000 square feet of housing and 200,000 squarefeet of Corporate Co-location Space—bringing the amount of development area to more than two million square feet.

By 2043, the campus will be at peak capacity, with dedicated academic and research space made up of classrooms, seminar rooms, offices, and labs will educate and inspire young entrepreneurs. A conference center will provide ample room for commercial activities, and a corporate partnership center will encourage and support startups that spring from innovative research. Approximately 536 faculty and researchers will teach, work, and research alongside almost 2,000 students—and staff will buoy the research and entrepreneurial activities of the NYC Tech Campus. The total full-time population is estimated at over 2,500.

At full build, the economic impact of the NYC Tech Campus will be enormous. Considering direct impacts and the multiplier effect, the campus will generate more than 7,600 full-time equivalent jobs, $2.3 billion in employee earnings, and $8.65 billion in City-wide economic activity. Please see the "Economic Impact of the NYC Tech Campus" in the Appendix.

Preferred Phasing – Incremental

Phase:	1A - Off Site		1B		1C		2		3		Full Build	
Opens:	FY 13 Fall 2012	FY 15 Fall 2014	FY 17 June 2017		FY 20 Jun 2020		FY 27 June 2027		FY 37 June 2037		FY 43 2042	
Academic:	20,000	20,000	150,000		50,000		185,000		235,000		620,000	
Corporate Co-Location:	–	–	–		100,000		200,000		200,000		500,000	
Subtotal:	20,000	20,000	150,000	27%	150,000	100%	385,000	61%	435,000	64%	1,120,000	55%
Housing:	–	–	300,000		–		250,000		250,000		800,000	
Conference Center:	–	–	100,000		–		–		–		100,000	
Subtotal:	–	–	400,000	73%	–	0%	250,000	39%	250,000	36%	900,000	45%
Total CornellNYC:	20,000	20,000	550,000	100%	150,000	100%	635,000	100%	685,000	100%	2,020,000	100%
School (location TBD):	–	–	80,000		–		–		–		80,000	
Grand Total:	20,000	20,000	630,000		150,000		635,000		685,000		2,100,000	

Alternate Phasing Strategy

We believe that with the exception of the proposed, optional high school, all of the proposed uses for the NYC Tech Campus are essential elements of a successful academic and commercialization program. Therefore, we maintain that all uses should count toward the RFP requirement that "the majority of space must be for academic or research use." We also believe that our proposal maximizes the site's development capacity at an aggressive, but appropriate, scale. However, in the event that Cornell is required at all times to maintain a minimum of 50% of the space for teaching and research, we propose the following alternative phasing strategy.

In Phase 1, we propose developing 150,000 square feet of space for teaching and research as outlined above, and 150,000 square feet of housing for faculty, students, and staff. In Phase 2, we will build 235,000 square feet of teaching and research space, and will work with third parties to develop 250,000 square feet of corporate co-location space, 350,000 square feet of housing, a 100,000 square-fot conference center, and an optional 80,000 square foot 9-12 public high school. Finally in Phase 3, we will develop an additional 235,000 square feet of academic and research space, complemented by the development of 250,000 square feet of corporate co-location space and 300,000 square feet of housing, for a total development of 2.1 million square feet.

We see this alternative as less desireable. It will delay the development of on-campus houisng and the conference center, both of which will contribute to a vital, bustling 24/7 innovation community. In addition, both the housing and the conference center will create new jobs and economic activity for New Yorkers, generating new tax revenue for the New York City.

Housing Demand Summary

Phase		1	2	3	Full Build
Opens		June 2017	June 2027	June 2037	2043
Unit Counts					
Faculty Junior 1-BR		12	33	52	62
Faculty 1-BR		24	66	105	124
Faculty 2-BR		23	65	105	125
Post Doc Studio		60	99	133	150
Graduate Studio		16	44	74	89
Graduate 1-BR		61	167	281	338
Total Units		**264**	**661**	**1,064**	**1,266**
Graduate Student Bed Counts					
Graduate 1-BR		92	251	422	507
Graduate 2-BR		170	468	785	945
Total Beds		**278**	**762**	**1,281**	**1,541**
GSF	GSF/Unit				
Faculty Junior 1-BR	633	7,590	20,873	32,890	39,215
Faculty 1-BR	748	17,940	49,335	78,488	92,690
Faculty 2-BR	1,035	23,805	67,275	108,675	129,375
Post Doc Studio	575	34,500	56,925	76,475	86,250
Graduate Studio	518	8,280	22,770	38,295	46,058
Graduate 1-BR	690	42,090	115,230	193,890	233,220
Graduate 2-BR	863	58,650	161,288	270,825	326,025
Total GSF		**192,855**	**493,695**	**799,538**	**952,833**

Alternate Phasing – Incremental

Phase	1		2		3	
Opens in	FY 17 June 2017		FY 27 June 2027		FY 37 June 2037	
Academic:	150,000		235,000		235,000	
Corporate Co-Location:	–		250,000		250,000	
Subtotal:	150,000	50%	485,000	52%	485,000	62%
Housing:	150,000		350,000		300,000	
Conference Center	–		100,000		–	
Subtotal:	150,000	50%	450,000	48%	300,000	38%
Total Tech Campus:	**300,000**	**100%**	**935,000**	**100%**	**785,000**	**100%**
School:	–		80,000		–	
Grand Total:	**300,000**		**1,015,000**		**785,000**	

Transforming the NYC Economy

The NYCTech Campus will be wholly dedicated to technology commercialization and entrepreneurship, in fields and forms that fit the economic strengths and needs of New York City. We have set the bar high. Our aim is not only to create a vibrant learning and doing environment on the Roosevelt Island campus itself, but to have a transformational impact on the city's economy.

Critical Ingredients of Success

Technologically-driven companies are increasingly focused on using technology to create new forms of commerce and human experience, rather than concentrating on the technology itself. New York City is ideally positioned for this shift. It is the global capital of commerce and culture as well as having a burgeoning tech sector with many of the nation's leading young tech companies such as Etsy, Foursquare, Gilt Group and Tumblr. The city's tech ecosystem is fundamentally different from other centers such as Silicon Valley, where the technology itself has traditionally been the primary focus.

While the city is well positioned for the tech sector of the 21st century, there are also considerable risks. The tech ecosystem in New York is in its adolescence; having recovered from a rough patch in early childhood it is now full of energy, promise and its own growing sense of identity. But it requires continued nurturing to achieve its full potential. Cornell, with its deep understanding of the city's unique tech ecosystem and the Technion's success in transforming Israel into a leading hi-tech country, are the right partners to maximize the potential and minimize the risks.

Successful tech ecosystems share several key ingredients: (i) visionary founders, (ii) serial entrepreneurs, (iii) seasoned early stage investors, (iv) great tech talent, (v) active tech M&A, and (vi) good infrastructure support (legal, banking, administrative, space, etc.). Based on our deep ties in New York City as well as meetings with over 200 industry leaders over the past few months, we believe that the city increasingly has the first three ingredients - founders, experienced entrepreneurs and investors - but needs more of each in order to grow the tech sector to match the scale of the rest of the city. Our goal is to bring more of these kinds of people to the city, as well as to provide the desperately needed tech talent to staff not only startups but companies of all sizes.

The final two ingredients, M&A activity and infrastructure have seen substantial growth and we believe this growth will continue now that there is a critical mass of tech companies needing these services thereby making them profitable to offer. As we describe below, the proposed NYC Tech Campus will make a substantial contribution to all of these key ingredients of the tech ecosystem.

As discussed in Section 3.01, the educational and research programs at the Tech Campus are designed from the ground up to foster

technology innovation and entrepreneurship in New York City, particularly through the interdisciplinary research hubs that serve major industry sectors in the city, the extensive involvement of local industry mentors, and a hands-on approach of close industry ties. The Tech Campus will serve as a magnet to attract the best tech minds and the greatest tech needs to one place, resulting in innovative new research and development that will drive the creation of new companies and the growth of existing ones. Proximity plays an important role in getting the best minds together, focusing them on commercial and cultural impact, and building strong working relationships with the local tech ecosystem to make New York the most attractive place to transform new ideas into new businesses. The density of companies, people, and creativity in New York offers an unparalleled opportunity when coupled with schools like Cornell and the Technion. Cornell already attracts the very best faculty and students in technology, with its top-5 Computer Science Department, top-10 Engineering school, star faculty, and exciting groundbreaking research. Moreover the Technion brings unrivaled technology transfer expertise from a similar service economy in Israel.

Talent Retention

From the ground up, this campus is designed to generate and retain startup companies in New York City. The hubs we envision as an integral element of our initial program are tied to economic sectors with significant mass here. Successful companies that come out of the Tech Campus hubs will thus naturally be inclined to remain and flourish in New York City.

A key component of our approach to retaining our students in New York City when they graduate is to create a multitude of ties to the local tech and investor communities while they are in school. As described in Section 3.01, drawing on Cornell's approximately 50,000 alumni who live or work in the city, the program will connect every student with mentors based on the student's interest. According to a recent survey of alumni, over 4,500 people are willing to serve as mentors to students interested in forming companies. Mentors are a powerful way to tie students to the city and that connection will be reinforced

by the academic program, which emphasizes project-based learning, and guest lecturers.

We also expect the Tech Campus to substantially increase the number of tech students from Cornell's Ithaca Campus who will move to New York City. We plan to offer semester and summer programs for these students, to connect them to the tech community in the city as well as to the entrepreneurial activities on the Tech Campus. Currently Cornell's Engineering and Computer Science alumni move to New York at only about 2/3 the rate of our alumni overall (15% versus 21%). Instead these alumni tend to move to other areas in the country with large tech industries. With the Tech Campus offering programs for these students, at both the undergraduate and graduate levels, we expect literally thousands more Cornell graduates from the Ithaca campus in these fields to move to New York. We believe this is a unique advantage of Cornell in driving the tech ecosystem in New York, in that the city will benefit to such a large extent from students on the main campus as well as the New York campus. Indeed, for schools that have strong commercial ties on their main campus in other locations, the effect may be exactly the opposite, namely that students educated at the New York City campus will be drawn away from the city by those strong commercial ties.

Another important aspect of our approach to retaining students is to foster the development of technologies that are best pursued in New York City, through the interdisciplinary hubs that tie to key industry sectors in the city. Not only are we interested in companies that will be started in the city, but also those that will stay here even if they are acquired by companies elsewhere in the country or the world. A good example is the online ad exchanges DoubleClick and Right Media, which were founded in the city and which remain here despite having been purchased by Google and Yahoo! because they are so deeply tied to the advertising industry headquartered in New York. Indeed Google's large office in New York can be traced to the Double-Click acquisition, where rather than moving the ad network people out of the city they chose to move engineers in. In this context it is worth noting that Right Media was backed by Cornell alumni Noah and Jonah Goodhart who

are currently both partners in early stage investor WGI Group and co-founders of advertising technology company Moat.

Company Formation and General Entrepreneurship

The program structures discussed above that are designed to keep students in New York upon graduation also serve to encourage and support general entrepreneurship. Students with entrepreneurial interests will be assigned mentors who are entrepreneurs and will do hands-on projects with startup companies or alternatively to prototype their own product ideas. The goal is to infuse exposure to entrepreneurship throughout the educational and research programs of the NYC Tech Campus, and to provide considerable opportu-nities to those students who are interested in possible entrepreneurial paths.

As discussed in the economic impact study, it is anticipated that 30 years following the opening of the NYC Tech Campus, some 500 new companies will have their roots there, directly and indirectly employing 30,000 people and creating nearly $44 billion in economic activity.

Incubating Success
True entrepreneurship requires a full commit-ment of time and attention that is counter to the multifaceted nature of an educational environment. Thus a key component of the proposed activities is what we term a bridge to entrepreneurship, which is a pre-accelerator or pre-incubator program. This bridge combines external mentorship, creating a prototype of a product, putting together a pitch, and presenting at a public demo day event, essen-tially all of the steps of an accelerator or incubator program but on a part-time basis. The bridge is designed to prepare students to win the competitive entry process of the best accelerators and incubator programs in the city, and we have met with several of them in developing this approach, including Betaworks, Dreamit and General Assembly.

In addition to the bridge program, we will seek accelerator or incubator programs that want to operate facilities directly at the NYC Tech Campus. These partners will have more ready access to students by virtue of proximity, but a key aspect of the our overall approach is that

student projects will be presented broadly at open demo days and venues that attract a wide range of potential investors. Encouraging competition among both students and investors is the best way to create successful new businesses.

A final key component of company formation is a new angel network for the NYC Tech Campus, composed of experienced early stage investors who are interested in working with and investing in companies started by students, faculty and researchers at the campus. Angel investors who are in New York will have early access to companies being created on the new campus by virtue of their proximity to the campus. In our broad-based survey of alumni, over 1,700 people said that they had made angel investments in compa-nies, and nearly all of these expressed an interest in being part of an angel network for the NYC Tech Campus (indeed considerably more expressed such an interest, but we believe that a more conservative estimate of the potential size of such a network is the number of experienced angel investors in the alumni base). A network of anywhere near this scale active in funding startups in NYC would be truly transformative for the city.

In addition to a world-class curriculum, the NYC Tech Campus will offer students and faculty a variety of programs and support services to assist them with their business plans; further prepare them for careers at technology-driven startup and growth companies; teach them how entrepreneurs think, create, and execute; and enable them to understand how venture capitalists analyze and build companies (and how they run their own firms).

The NYC Tech Campus will host frequent on-campus seminars led by entrepreneurs, technology innovators, and venture capital-ists. On-campus Entrepreneurs in Residence will work closely with students and faculty on their startup ideas and the process of company creation.

Business Competitions
The NYC Tech Campus will host a variety of short- and long-pitch competitions for students, faculty, and staff. Some competi-tions will be organized around a theme, such as sustainability. These events will be highly visible, with judges drawn from all areas of the

New York City tech ecosystem. This would complement the Cornell Venture Challenge in Ithaca, with an emphasis on the NYC Tech Campus on demos and prototypes as well as business plans.

Legal Support

A group of prominent law firms will partner with NYC Tech Campus to provide on-campus seminars, business-development services, and assistance with tech transfer and other legal issues as they arise. In addition to the twenty-plus active mentoring firms in BR Legal's current network, Wilson Sonsini Goodrich & Rosati, DLA Piper, WilmerHale, and Choate Hall & Stewart, LLP have agreed to work with NYC Tech Campus, making commitments of human capital as well as financial sponsorship.

Building on the success of BR Legal in Ithaca, Cornell Law students will help Tech Campus companies get started on sound legal ground. A practicing lawyer will mentor each law student, potentially going on to serve as the startup company's full-time lawyer down the road.

With our network of law firms and other partner institutions, we will:

- Schedule weekly on-campus office hours for students and faculty;

- Hold startup boot camps on a regular basis, often in conjunction with Cornell's tech transfer office; and

- Introduce NYC Tech Campus startups to appropriate funding sources

Technology Transfer

The NYC Tech Campus will operate under a set of policies and practices designed to facilitate startup formation and technology licensing as opposed to the generation of licensing revenue. In fact, our financial model assumes no licensing revenue; eschewing the short-term benefits of technology licensing, we plan to rely on future philanthropy from successful entrepreneurs and their companies. By the same logic, the campus incubator will be a separate space and not considered a "Cornell facility" from an intellectual-property standpoint.

Technology Transfer via Startup Creation

Traditional universities tend to be focused on protecting their IP. At the NYC Tech Campus, ideas that lead to startup companies in the proposed hub areas will be market- and customer-focused. The research excellence of the tech campus coupled with its innovative educational programs will attract an outstanding pool of entrepreneurial students to the Tech Campus. It is the students who will be the primary drivers of technology transfer.

Companies created without prior IP

New companies associated with universities fall into two major categories: those that rely on the university's talent and expertise, and those that rely heavily on university-owned IP. For new companies that rely on entrepreneurial creativity to fulfill market needs, their primary driver of success will not be university-owned IP, but simply the talent pool of students in an environment that encourages entrepreneurship. In this scenario, the issue of technology licensing from the university does not arise, as most of the technology required for creating the startup company is created by students that are not employees of the university.

The primary mechanism to encourage this form of technology transfer is to facilitate the exchange of ideas between businesses and the expertise at the NYC Tech Campus. Interaction spaces and access to university researchers are both critical for this purpose. Cornell faculty and research staff can participate in this exchange in addition to students when the ideas discussed are not directly related to their Cornell research or existing Cornell IP. For this type of scenario, an express consulting agreement that does not involve Cornell research or IP can facilitate a more formal relationship between individual faculty and other companies.

Companies licensing Cornell IP

Companies created to commercialize Cornell IP can benefit from some of the ideas previously described, except that federal standards for research compliance require certain measures be taken to ensure the integrity of university research. Our goal for the NYC Tech Campus is to minimize the impact of the compliance requirements on technology transfer. This is particularly important for new

companies based on Cornell IP. Cornell has a standard IP licensing agreement that can help mitigate this issue. In addition, we will create standard licensing terms (royalty rate, percentage ownership, and cash payments) that are technology-sector specific so that licensing terms do not require significant negotiation. These terms will be created jointly by Cornell's tech transfer office, namely the Cornell Center for Technology Enterprise and Commercialization (CCTEC), and by leaders in the venture capital community. Since the terms of the agreements will be acceptable to CCTEC and the venture capital community, there should be little a priori barrier to startup creation due to licensing terms.

Company Expansion

With existing businesses, we will follow the outline of our approach with startup companies that license Cornell IP. The key difference is that, technology transfer and IP licensing will be simplified by the absence of any potential complications due to the dual role of an inventor as a university employee and as a potential principal in the startup company.

In setting policies for the creation of joint IP, we will emphasize efficiency through standard terms, where possible having experts from the early stage investment community involved in developing standard agreements.

The curriculum and philosophy of the NYC Tech Campus is focused on giving students direct access to existing tech companies in New York City as well as the tools to create startup companies. Existing companies will be encouraged to form research partnerships with NYC Tech Campus faculty, researchers and students. Such companies will include small startups, medium sized firms, and large international corporations. Companies at different scales may seek quite different relationships with the campus, from sponsored

research agreements, to collaborative research that involves company staff co-located on the campus, to student intern projects. Such a varied set of interactions will be welcomed, and will provide our students with a broad range of possible career paths to investigate, as well as providing quite different collaboration opportunites for our faculty and staff.

The NYC Tech Campus will be the focal point for companies that would like to engage with our students and with the new ventures housed at the campus incubator. Companies of all scales will pass through the campus to learn about the latest research developments. We will organize public lectures and hold "demo nights," encouraging students with promising business ideas to make presentations to angel investors and VCs. In our physical plans, we have provided for the possibility of inviting at least a few established companies to open offices on the campus.

Cornell and The Technion have a strong history of research collaboration with a wide range of leading tech companies such as Verizon, Google, Yahoo, Microsoft, Intel and Facebook. These research collaborations will be enhanced by the tech campus, which is designed to have employees of companies located on the campus, as well as to foster a wide variety of interactions between students, researchers and companies. We envision existing corporate relationships as expanding given the commercially focused nature of the research hubs and the large graduate programs, as well as the opportunity to form relationships with many additional companies, especially those with a presence in New York City.

Faculty Profile
Moshe Shoham

Medical and micro robots

A member of the Faculty of Mechanical Engineering and head of the department's Center for Manufacturing Systems and Robotics, Moshe Shoham can remember the very first robots to arrive at the Technion in 1982. (He was part of the welcoming team.) About a decade ago, Shoham launched the field of medical robots. Today, Mazor Surgical Technologies, which he founded in cooperation with the Technion, is one of the world's leading medical-robot companies, specializing in spinal surgery technology.

Shoham and his teammates Oded Salomon and Nir Shvalb recently built a micro-robot (called Virob) as part of an effort to extend robotics to medical

Technology Transfer at the TCII

The commercialization challenges in New York include:

- A broadly-based, service-oriented economy

- Limited industrial infrastructure

- Limited coordination of private sector, academic and governmental efforts

- Bottlenecks in early commercialization stages – for example, lack of "smart" pre-seed funding for late-stage applied research, and lack of academia-industry relationship

These same issues have been tackled by the Technion in Israel, and we are confident that the technology transfer model developed there can readily be adapted to the TCII. Moreover, with its emphasis on applied research in highly focused domains, TCII will be tuned to commercial potential, customer needs and market forces. TCII will not only maximize and capitalize upon commercial gains stemming from its own research, but also produce a steady stream of quality human capital which will provide a much-needed quantum leap for the NYC innovation economy.

We believe that a good commercialization process should provide the platforms which will allow the technologies developed at TCII to realize and maximize their potential and evolve into successful, independent enterprises.

TCII will focus on removing many of the obstacles that slow the development of industry while building a platform that enables all participants (faculty, students, TCII, industry, investors, plus others) to realize their maximum potential. The proposed process for commercialization focuses on four areas of action:

- Nurturing a culture of entrepreneurship

- Creating, identifying and protecting intellectual property

- Developing funding and other commercialization resources

- Building a commercial growth path

Specific examples include:

Establish a pre-seed program/fund to support promising applied research at TCII. The funding currently available for much of the research conducted at universities across the world is aimed at advancing basic science and is rarely designated for commercialization. There are very few funds specifically aimed at promoting commercialization. TCII will facilitate the establishment of specialized donor-based pre-seed programs/funds/foundations aimed specifically at advancing commercialization of TCII-originated research (e.g., building a prototype, completing a proof-of-concept, preparing a business plan, etc.).

Define IP bylaws and commercialization policies that are supportive of innovation and entrepreneurship:

- TCII commercialization policy will be flexible and will encourage and support start-up formation by faculty.

The greater the involvement and commitment of the faculty member, the larger will be his share in the newly formed venture.

- Establish a strong and proactive TCII Technology Transfer Office (TTO) that will focus on patenting innovation and delivering services to scientists and researchers at TCII, to industry and to entrepreneurs.

The TCII Technology Transfer Office will have the means and resources to outsource (when necessary) highly specialized services (IP search, business plan writing, market

tasks performed inside the human body. About a millimeter wide and 4 mm. long, Virob is designed to move inside blood vessels, tissue, and even vital organs such as the lungs.

The aim is for such robots to carry medication, releasing it at a precise spot so that, for example, anti-cancer drugs can be delivered to the tumor itself. In addition, these robots can perform biopsies and other delicate operations, and potentially clean blocked drainage pipes that have been implanted in surgery. By one means or another, micro-robots have the ability to transform how doctors prescribe medicine and treat patients.

research, plus others). The TTO's commercial-
ization policies, IP and equity ownership rules
and procedures will be straightforward and
aligned with industry and the financial sector.
In many ways, TCII TTO will act as a virtual
incubator and will provide matchmaking
services to potential entrepreneurs, investors,
and others, providing necessary support for
the creation and signing of licensing/founding
agreements. It will serve as a conduit between
industry, venture capitalists, and faculty.

• Improve early commercialization.

Facilitate the creation of a world-class
internal incubator with first-rate business and
management support which will work in
cooperation with TCII TTO. The incubator will
focus initially on Connective Media. Once the
program gains more traction, the establish-
ment of a second incubator, focusing on
Healthier Life, will be considered. Through
these incubators (but not only via them),
promising projects will gain access to
substantial pre-seed funding, and to impor-
tant supporting infrastructure and managerial
experience. Joining either incubator will be
conditional upon maintaining activity in NYC
for a period of at least 3 years. We expect that
these incubators will contribute to the
creation of a dynamic entrepreneurial cluster
of activities in these selected focus areas.

• Establish an Entrepreneur in Residence
  (E.I.R.) program.

A proactive on-going effort will be made to
"marry" successful entrepreneurs to TCII
researchers. An entrepreneur will be granted
an option to commercialize a specific tech-
nology, subject to the achievement of certain
milestones (raising seed capital, etc.). The
program will focus primarily on entrepreneurs
based in NYC.

Community Service: Mission-Critical

Like entrepreneurship, community engagement comes naturally to Cornell and the Technion. The NYC Tech Campus has been designed from the start to be a good neighbor to Roosevelt Island, Queens, and New York City as a whole. This project holds multiple opportunities for us to broaden and deepen our constructive involvement in the city, first and foremost through a set of ties and initiatives involving public education.

Good Listener / Good Neighbor

As the land-grant university for the State of New York, Cornell applies the results of its endeavors in service to its alumni, the community, the state, the nation, and the world. To share the benefits of its research and teaching programs with all people, Cornell is active in every county of the state. The university also provides a wealth of successful local, national, and international programs for young people, life-long learners, and children.

Over the past seven months, Cornell's project team has met with a wide range of public officials, community groups, educational leaders, and others from around New York City. These consultations have shaped a set of tentative plans for the campus's relationship, in the first place, to Roosevelt Island itself – plans that include community gardens, efforts to bring about improved transportation service on the East River as well as the island,

accessibility for seniors and the disabled, sustainability and energy efficiency, streets and infrastructure, and a healthy, vibrant retail business district.

Educational Opportunities

Public K-12 education is a place where the expressed wishes of our neighbors align precisely with Cornell's institutional experience, enthusiasm, and strength. Programs designed to foster deep, genuine interest and experiential learning in science, technology, engineering, and math (STEM) are key to increasing participation in STEM-related professions and ultimately, to growing New York City's tech sector.

Following are a number of opportunities that Cornell plans to pursue further with the NYC Department of Education—they include

Alumni Achievement
Will Glaser '87

Founder, COO and CTO
Pandora Media

Anointed one of the 100 Most Influential People in High Technology by Microtimes, Will Glaser founded Pandora Media, the leading provider of online radio, serving the company as both COO and CTO. He has been the driving force behind a number of other successful startups, focusing on the integration and deployment of sophisticated new technologies. A triple major in Computer Science, Math, and Physics at Cornell, Glaser currently operates a consulting practice that specializes in business startups, new product architectures, and high technology turn-arounds.

We did our research in the community

Some of the NYC agencies, organizations, and political leaders consulted by Cornell

NYC Department of Education
> Deputy Chancellor,
> Division of Portfolio Planning, Marc Sternberg

> Deputy Chief Academic Officer for Instruction,
> Joshua Thomases

> Executive Director of School
> Improvement, Division of Portfolio Planning, Alex Shub

> Deputy Executive Director,
> Office of Post-Secondary Readiness, Melissa Silberman

New Visions for Public Schools
The Institute for Student Achievement
The Urban Assembly
College Summit
New York Hall of Science
Principals of PS/IS 217 and The Child School
PTA leaders and community advisors of PS/IS 217 and The Child School

Board members of the Roosevelt Island Operating Corporation
Members of the Roosevelt Island Residents Association
The Roosevelt Island Senior Association
Roosevelt Island Disabilities Association
Community Board 8

State Assemblyman Micah Kellner
Congresswoman Carolyn Maloney
Councilmember Jessica Lappin
Queens Borough President Helen Marshall
Councilmember Jimmy van Bramer

Long Island City Business Development Corporation
Long Island City Partnership
Queens Economic Development Corporation
Queens Chamber of Commerce
The East River Development Alliance
Consortium for Worker Education
STRIVE

Building & Construction Trades Council, Gary LaBarbera
Building & Construction Trades Council, Joe Ramaglia
Glenwood Management, Charles Dorego
Gotham Organization, Joel Picket
NYC AFL-CIO, Denis Hughes
Operating Engineers, Kuba Brown
Real Estate Board of New York, Steven Spinola
Service Employees International Union, Mike Fishman

working with existing schools on Roosevelt Island, a new high school focused on STEM fields, and programs to support teachers and students across the City.

1. The Roosevelt Island schools

Cornell is eager to work with the two local schools on Roosevelt Island, which primarily serve elementary and middle grades children—the ideal ages, as research shows, to spark students' interest in math and science. Access to high-quality local schools will be important in attracting faculty, staff, and students to the NYC Tech Campus, especially given the 24/7 live-work community we will create.

PS/IS 217: Cornell sees many opportunities to collaborate with the principal, teachers, and parents of this K-8 school through programs designed to enrich the curriculum, improve school quality, and provide children with an early introduction to experience-based science, technology, engineering, and math (STEM) learning.

The Child School: A school serving children in grades K-12 with learning challenges from all five boroughs, the Child School is also eager to collaborate with Cornell. The Child School expressed particular interest in enlisting Cornell's participation in STEM-oriented afterschool programming for middle and high school students (such as Cornell's Odyssey of the Mind, Science Olympiad, and First LEGO League robotics programs and competitions) and in professional learning for teachers in STEM subjects and research through programs at Cornell.

2. CornellTech: a Decisively New High School

In collaboration with an experienced New York City education partner, Cornell proposes to establish a new public high school (grades 9-12) with a technology-and-enterprise focus. Cornell's vision is to contribute to the development and operation of a school whose academic approach and desired learning outcomes mirror those of the NYC Tech campus. A small high school, potentially located on Roosevelt Island and fully integrated in the NYC Tech Campus, CornellTech High would offer an interdisciplinary, applications-based academic program, opportunities for hands-on research and experimentation,

and educational pathways leading to college or other postsecondary training, advanced STEM degrees, and rewarding employment in the tech sector. In collaboration with Cornell's corporate partners, the new school will encourage and support student innovation, entrepreneurship, and team work in every aspect of the learning experience.

Academic Program

The NYC Tech Campus will be developed around innovative tech-oriented research and application hubs, which will evolve over time. Initial hubs planned include "Connective Media," "Healthier Life," and "Built Environment." Each hub represents a vital focus for the City's future economy and workforce development and a highly promising area for student learning. Research by the New York City Department of Education (NYCDOE) suggests that employment will grow significantly in these areas in the coming decades. Working with an education partner and the NYCDOE, Cornell proposes to translate the academic focus of each hub into a robust, high school-level academic program, leading seamlessly into postsecondary opportunities for every student.

A specially designed curriculum associated with each hub will incorporate innovative approaches to teaching science, math, and other core content, providing students with a multitude of opportunities to learn rigorous content; develop problem-solving, design, and collaboration skills; and build the skills, knowledge, and competencies needed for college and career success. Essential principles of the curriculum will include experienced-based learning, opportunities for hands-on research and tech projects, and a thorough grounding in the principles of scientific inquiry. Like the NYC Tech Campus itself, CornellTech High will become a living laboratory for science- and tech-rich education.

Student Support

Recognizing that rewarding 21st century employment requires college, postsecondary technical education, and/or rigorous ongoing learning, CornellTech High will ensure that all students graduate with the preparation they need for college, further technical education, or tech-sector employment. Cornell's corporate partners will work closely with the

university and its education partner to define the competencies needed for college and employment, chart educational and experiential pathways from high school to jobs in their industries, and develop demanding, high-quality experiences that enrich and enable student learning.

Cornell's NYC Tech Campus will give high school students direct exposure to a university campus and college-going culture, both on Roosevelt Island and in Ithaca. Students at CornellTech High will engage with Cornell graduate students and alumni volunteers, who will work as mentors, advisors, coaches, and competition judges in a range of activities during the school day, after school, and during summer and other out-of-school hours. With its education partner, Cornell will explore the nation's leading college-prep programs, such as College Summit, and develop an array of services to support students and adult volunteers. Cornell will also examine the feasibility of creating a scholarship program for outstanding graduates of CornellTech High.

Teacher Professional Learning

CornellTech itself will be a rich environment for teacher learning. It will serve as the pilot site for a range of successful teacher training programs that Cornell envisions offering more broadly throughout the City in science, computer science, and technology. CornellTech High teachers may also participate in summer residency programs at the NYC Tech Campus and in Ithaca and will have access to a wealth of available software and curricular content. In addition, Cornell expects that CornellTech High teachers will become resources in interdisciplinary, applications-oriented STEM instruction. We envision encouraging them to participate as faculty members in professional learning programs offered to teachers in other New York City schools.

School Organization and Profile

CornellTech High will ideally be a small school, serving approximately 450 students in grades 9-12. (In collaboration with its education partner and NYCDOE, Cornell will study the relative advantages of operating as a district or charter school and make a determination in the near future.) Admission will be open and untested, based on a lottery system. Cornell is

strongly committed to encouraging its own faculty, staff, and graduate students to enroll their children in the school—thus strengthening and enriching the entire campus community—and will explore the feasibility of developing appropriate policies and incentives to encourage that result.

Cornell anticipates operating the school in collaboration with an education partner with significant expertise in school development, curricular planning, teacher and principal recruitment and performance management, operations and finance, technology, and other areas. Cornell has opened discussions with three potential partners to date—the Institute for School Achievement (ISA), New Visions for Public Schools, and The Urban Assembly—and expects to meet soon with representatives of NYCDOE's I-Zone to further discuss design possibilities. Letters of interest from potential partners are included in the Appendix.

Cornell expects to work closely with the NYCDOE to identify a location for the new school. We believe Roosevelt Island would be a compelling site for CornellTech High. Embedding the high school directly within Cornell's graduate campus would provide an unparalleled opportunity to design a school whose facilities, curriculum, and outcomes embody a new approach to STEM education. On the other hand, a site in Long Island City or elsewhere in Queens could reinforce the NYC Tech Campus' unique relationship to the borough, which we see as a destination for companies associated with the tech campus, and there may be advantages associated with incubating CornellTech High in an existing school. We would collaborate with the NYCDOE and other parties to seek private and/or public funding for the construction or renovation of an exciting, world-class high school facility.

Proposed Implementation Plan

Upon designation by NYCEDC, Cornell intends to advance discussions with potential education partners, make a selection, and enter into a formal partnership agreement detailing roles and responsibilities. The education partner would take the lead in managing an intensive planning effort with the NYCDOE and recruiting a visionary principal, as well as planning for school operations. This effort would culminate in the submission of a New Schools Application for CornellTech High. The opening date will depend on the school's location. If the school is located within an existing facility, the first class of 9th graders could matriculate as early as fall 2015; if the school is located in a new facility on Roosevelt Island, the opening date would be 2017 or later.

3. STEM Teaching Across NYC

Cornell recognizes that the broadest and most sustained impact on school age children can be accomplished through the creation of high-quality teacher training and professional development programs. As part of its commitment to public engagement in New York City, Cornell is interested in launching a citywide initiative to introduce advanced methods and subjects to the teaching of science and technology in the public schools. This project will build upon Cornell's highly regarded teacher training programs in physics, biology, chemistry, engineering, particle physics, ornithology, and mathematics, some of which are already serving many New York City public school teachers.

Cornell's current programs expose teachers to cutting-edge research in the STEM disciplines and provide them with engaging, hands-on laboratory activities for students. Teachers receive free, web-based materials for classroom use and access to a lending library of classroom activity sets and hardware maintained by Cornell. Currently, there are over

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20,000 student uses per school year nation-wide of Cornell-developed laboratory activities created and maintained for biology, chemistry, and physics teachers.

We have found that teachers heavily depend upon these Cornell resources to bring 21st century science to their students. The NYC Tech Campus will enable us to develop new laboratory activities based on the interdisciplinary program hubs envisioned for the university – initially in areas such as Connective Media, Healthier Life, and the Built Environment. We will work in partnership with the NYC Department of Education and United Federation of Teachers' teacher centers to provide dedicated hardware lending libraries, updated websites with downloadable lab documentation including curricular standards information, and the associated teacher training for New York City public schools desiring these resources.

Cornell's teacher training initiatives include far more than access to laboratory hardware. Existing Cornell programs featuring online courses, classroom visits, and in-residence programs—some with graduate credit—will be implemented at the Roosevelt Island campus, making them much more accessible to New York City teachers. We have found that teachers greatly value the opportunity to visit the Cornell campus in Ithaca and go back to their classrooms excited to share with their students what they learned about state-of-the-art science and engineering research at Cornell. At the Roosevelt Island campus, we will offer similar opportunities for teachers to attend workshops and faculty lectures, tour research facilities, and participate in professional development activities. The NYC Tech Campus will expand these proven programs and make them available to many more New York City teachers.

4. Programs for Students

Cornell's NYC Tech Campus will offer a number of resources that could be deployed in service of public education. First among these is the university's distinguished faculty, whose members could serve as resources for STEM education by sharing their cutting-edge knowledge with teachers, contributing to the development of teaching materials and learning activities. Cornell's interdisciplinary s program hubs, translated into age-appropriate learning objectives and curricula, will pique elementary and secondary school students' interest in STEM by demonstrating how social networks, medical diagnostics, and environmentally sound building practices can impact their lives and the promise of their futures. The NYC Tech Campus's graduate students can support students with mentoring, homework help, tech competitions, and afterschool programs, continuing a rich Cornell tradition of service. Cornell's corporate partners will provide internships and exposure to industries and career paths. And the facilities available at the NYC Tech Campus will offer myriad opportunities to provide students and teachers with access to state-of-the-art labs and equipment and give students experience with a campus environment and college-going culture, both in New York and Ithaca.

Based on this research, Cornell proposes the following programs, which would have a significant impact on New York City schoolchildren.

The main goals of our student-serving programs are to:

- Promote student interest in science and engineering;

- Increase graduation rates and the number of students who attend college; and

The Na-Nose arose out of a body of research involving the screening and diagnosis of disease via tissue samples as well as breath; volatile biomarkers; nanosensor-based artificial olfactory systems; and molecule-based electronic devices and sensors. Professor Haick and his team of Technion researchers have registered more than 20 patents so far; they have also launched a startup company, Nanose Ltd., through the Alfred Mann Institute of the Technion. Haick, the company's founder and chief scientific officer, has already won millions of dollars in grants and awards. He and others hope that the technology will one day be used by general practitioners to obtain instant cancer diagnoses without the need for invasive blood tests or biopsies.

- Expose students to a campus environment, university research, and career opportunities in STEM fields

To achieve these program objectives, Cornell will leverage the university's relationships with organizations, corporate partners, and especially, our enthusiastic community of faculty, graduate students, and alumni. With nearly 50,000 alumni in the New York City metropolitan area—the NYC Tech Campus is uniquely positioned to take on the challenge of providing children with stimulating group activities and meaningful one-on-one contact.

Examples of student-serving programs that could be housed at the NYC Tech Campus include:

HISPA: An organization founded by a Cornell alumna, HISPA connects Latino professionals as mentors and role models to Latino middle-school students on an on-going basis, serving to improve academic performance and reduce drop-out rates. Cornell has over 1,750 Hispanic alumni in New York City, several hundred of whom have STEM degrees and who will be ideal candidates for mentoring young Hispanic teens and introducing them to STEM careers.

Curie and Catalyst: These summer programs bring young women and underrepresented minority students interested in STEM careers to Cornell's Ithaca campus for an engaging, week-long introduction to the world of engineering. The NYC Tech Campus will enable Cornell to expand these programs, reaching more New York City teens.

College Summit: Cornell is interested in working with College Summit, a well-regarded national program that trains peer leaders to encourage college attendance in their schools, and provides support to students in preparing their college essay and deciding upon candidate schools. The NYC Tech Campus, as well as

Cornell's Ithaca campus, could participate in hosting students and providing volunteer help from within the Cornell community.

Science and Math Competitions: Cornell will draw upon its community of faculty, graduate students, corporate partners, and alumni to serve as coaches for STEM competitions. For example, a Cornell alumnus is responsible for the New York City-based math team. With the NYC Tech Campus, we can support his efforts to identify more volunteers and teams to serve more students. Other competitions engage K – 12 students in science and engineering, sparking interest in STEM careers. Examples include Odyssey of the Mind, Science Olympiad, and First Lego League, all of which could be expanded in New York City. Please see the Appendix for a letter of interest from Jim Cocoros, Head Coach of the New York City Math Team.

Programs for Roosevelt Island Residents
From the inception of the Philip Johnson-John Burgee Master Plan to the development of the Tramway and Four Freedoms Park, Roosevelt Island has been an incubator of forward-thinking urban design. Its island geography and status as part of but distinctly separate from the Borough of Manhattan have allowed planners and local residents to consider imaginative and cutting edge initiatives, including prefabricated cladding on its original residential buildings, the automated vacuum collection system, and visions for car-free neighborhoods.

Roosevelt Island residents are currently developing technology applications to aid users of the island's bus system and have proposed plans to develop a zero-net-emission parking garage. The NYC Tech Campus with its research focus on smart technologies for the built environment and mobile applications, is excited to continue Roosevelt Island's

Faculty Profile
Yehuda Kalay

Pioneer of CAD

Yehuda Kalay is a dean in more ways than one. Besides being, the dean of the Technion Faculty of Architecture and Town Planning. He was a pioneer of computer aided design, or CAD, a field increasingly recognized as crucial to meeting the challenges of contemporary building and planning, including the key problem of sustainability.

Returning to Israel after getting a PhD from Carnegie Mellon University in 1982, Kalay discovered that his chosen field had yet to get off the ground there. Unable to find fulfilling employment, he went back to the U.S., where he helped launch CAD programs at the State University of New York in Buffalo, and then at the University of California Berkeley.

tradition as a forward-thinking urban laboratory. We hope to work closely with all communities on the island to develop applications for technologies originated by its students and faculty that can improve residents' quality of life.

In order to better understand the current and future needs of Roosevelt Island residents, the Cornell team has met with the leadership and board members of the Roosevelt Island Operating Corporation, members of the Roosevelt Island Residents Association, the Roosevelt Island Senior Association, the Roosevelt Island Disabilities Association, as well as Community Board 8. In addition, we met with State Assemblyman Micah Kellner, who introduced us to many of the community leaders noted above; Congresswoman Carolyn Maloney, and Councilmember Jessica Lappin; a meeting with State Senator Jose Serrano is in the process of being scheduled.

Consistent with views expressed by the Roosevelt Island residents we met with, Cornell envisions the NYC Tech Campus not as a walled-off compound apart from the adjacent neighborhoods, but rather as an open and welcoming campus that will be integrated into the Roosevelt Island community. Cornell will continue to explore all viable ideas and initiatives to support this vision, including bringing tech related activities and incubators to Main Street, working with Roosevelt Island leaders to develop shared services in areas such as transportation, energy and security, and working with local schools, as highlighted above. Cornell is also exploring the possibility of leasing space in Roosevelt Island for the Phase 1A start-up operations of the NYC Tech Campus, should sufficient and adequate space be available.

We look forward to continuing our discussions with Roosevelt Island leaders and residents and further identifying how Cornell can be an effective and valuable community partner.

Long Island City / Queens Connection

Long Island City and Western Queens are integral components of the tech ecosystem. As technology companies initiated by Cornell and Technion affiliates grow and their space needs become more acute, affordable space for offices, exhibit areas, and proto-manufacturing facilities will become critical. The shortage of such space has historically been a hindrance to the development of a more robust tech industry in New York City; however, Long Island City and other areas of Western Queens, with their abundant and varied stock of commercial and industrial space, expansive new mixed-use developments, relatively low rents, excellent access to Manhattan, and an increasingly vibrant live-work culture, have proven themselves as viable locations for technology companies to locate and grow. In addition, these neighborhoods can contribute significantly to the NYC Tech Campus' workforce needs.

Cornell representatives have conducted extensive outreach in Western Queens, meeting with the leadership of the Long Island City Business Development Corporation and Long Island City Partnership, the Queens Economic Development Corporation, the Queens Chamber of Commerce, and the East River Development Alliance, and Queens Borough President Helen Marshall. The goal of these meetings has been to understand what initiatives these organizations already have in place, what their current and anticipated needs are and how a partnership with Cornell could most effectively foment entrepreneurship and commercial ventures.

His work has focused on the intersection of the cognitive and technological aspects of design, enabling architects to "produce numerous design solutions and check them visually and analytically before the design is approved," in Kalay's own words. "In architecture, one cannot build prototypes that can be tested prior to building the final product, like cars, telephones or computer software," he says.

Beyond the obvious benefits to architects operating in the real world of New York City, for example, his research has had an impact on the virtual world. Through a collaboration with the Berkeley Center for New Media, Kalay has used his technology to "rebuild" decaying historic neighborhoods and ancient cultures by means of video games that educate people about the past.

Inspiring Minority Students to Study Science and Technology

Setting out into the booming world of the late 1990s with top grades and a computer science degree from the University of Washington, Hakim Weatherspoon flirted with the idea of a lucrative job at Microsoft or Intel. But he wound up pursuing a doctorate at UC Berkeley and joining the computer science faculty at Cornell. "In an academic position," he says, "you can have tremendous influence and impact. You can affect the national agenda."

For Weatherspoon, now an assistant professor in the College of Engineering, the rewards include the ability to woo other young people – and members of underrepresented minorities in particular - into his chosen field. In June 2011, he gave a presentation to a group of Howard University and University of Puerto Rico students who had come to Ithaca to get a taste of serious computer science.

Weatherspoon's official task was to describe his own research and how it fits into a larger Cornell effort to improve the reliability of cloud computing, where data is stored and processed in remote data centers. The same SoNIC (SOftware defined Network InterfaCe) workshop featured talks by colleagues of his on other aspects of computer networking. But the underlying goal, in Weatherspoon's mind, was to encourage at least some of those college juniors and seniors to consider graduate study and lives dedicated, like his, to research and teaching.

Minority students were recruited because, Weatherspoon points out, they account for only about 3 percent of PhDs in computer science and engineering. The Computing Research Association surveyed nearly 1,500 PhD recipients from 2009 and 2010; just 17 were black, 22 Hispanic, and three Native American.

In college, Weatherspoon was both a stellar student and a marginal member of the Huskies football team. Often asked why he stuck with his role as fill-in roverback, he explained that he relished the mental side of that position ("you have to make a lot of quick decisions") as well as the challenge of pursuing two difficult life goals at once.

Weatherspoon still likes to have his plate full. In addition to his research, he hopes to have a hand in turning the NYC Tech Campus into a major driver of diversity in New York City's science and engineering community. Through its affiliated tech high school, he says, the campus will target students from underrepresented groups, get them involved in hands-on research, and help them find pathways to college, advanced study, and satisfying jobs. Through its outreach and teacher training programs, the Tech Campus will be able to plant these seeds early and city-wide. Hakim Weatherspoon is eager to be a part of all that.

Members of the Cornell team have spent much of the past three months in the neighborhoods of Western Queens, meeting with community leaders and gaining a better understanding of the landscape. We visited the Entrepreneur's Space – an initiative of the Queens EDC and NYCEDC – with the aim of exploring how such a program may be expanded beyond the culinary arts to include the applied sciences; we reviewed the services provided by the Long Island City Partnership to small businesses and toured commercial and industrial properties in Long Island City, Astoria and Sunnyside that could accommodate Cornell-affiliated companies. Finally, we met with the Queens Chamber of Commerce to gain a deeper understanding of the borough's business climate and economic development needs.

Each of these meetings has demonstrated to us that Long Island City and Western Queens have the essential components required to build a tech cluster adjacent to a major applied science research campus. In addition, Bishop Mitchell Taylor of the East River Development Alliance has agreed to work with Cornell and the Consortium for Worker Education to develop a workforce development and training program to ensure that 15% of the jobs at the NYC Tech Campus go to low-income New Yorkers.

Cornell proposes to establish a strategic alliance with these organizations so that they may collectively serve as a "one-stop-shop" or clearinghouse to help NYC Tech Campus-affiliated companies in all stages of development identify appropriate office or manufacturing space, hire staff, identify necessary vendors and suppliers, navigate any required permitting or public approvals processes, and seek assistance regarding incentives, financing and other services as required. We are excited about the potential to establish strong working relationships with these partners and view this initiative as vital to nurturing and growing a sustainable tech industry in New York City.

Please see in the Section 3 Appendix Letters of Support from these organizations.

Project Organization

Project Leadership

Sections 1.03 and 1.06 describe the general decision-making and approval processes for Cornell and the Technion, as well as the process used to ensure rapid decisionmaking throughout the negotiating process between Cornell and the EDC. In this section we describe the leadership structure for the NYC Tech Campus and the Technion-Cornell Innovation Institute (TCII).

The academic leadership of Cornell is committed to the success of the proposed campus. President Skorton will spend 25% of his time in New York City, on activities of both the Medical College and the Tech Campus. Provost Kent Fuchs will spend 20% of his time on Tech Campus related activities at least during the first few years.

NYC Tech Campus will be led by a new Cornell Academic Dean – someone with a world-class research reputation in a technological field, deep commercial experience, proven fund-raising abilities and outstanding academic leadership skills. The Dean of the Tech Campus will report to Provost Kent Fuchs and be a regular part of the senior academic leadership team of the University.

Because of the close ties between the Tech Campus and the Ithaca campus, the new Dean will work closely with the Deans of the academic units in Ithaca and Weill Cornell Medical College, collaborating on recruiting, on faculty appointments (tenure will be through Ithaca-based colleges as discussed in Section 3.01), and on joint research and academic programs between Ithaca and NYC. The Dean of Engineering, Lance Collins, and the Dean of Computing and Information Science, Dan Huttenlocher, will play a particu-larly important role in the new campus because their academic units are most closely tied to the new programs. These two Deans are each committed to spending at least 20% of their time engaged with the NYC Tech Campus.

Each Dean at Cornell has their own budget, and the NYC Tech Campus will be budgeted as any other academic unit at Cornell. The Chief Operating Officer for the Tech Campus, reporting to the Dean, will be have day-to-day responsibilities for the budget as well as for campus operations such as facilities, human resources, information technology, and finance. These administrative functions will, wherever possible, make use of central university functions or partner with the Weill Cornell Medical College in order to reduce administrative costs.

The Tech Campus will have both internal and external advisory boards, as detailed in Section 1.03. The external board will play the critical role of tying the new campus to industry leaders in New York City, and the internal board of tying the new campus to the Ithaca and Weill Cornell campuses.

TCII is a key component of the Tech Campus. It is a 50-50 partnership between Cornell University and the Technion, which will engage in research and education. Degree programs developed at the TCII are envisioned to be dual degrees of the two Universities. Intellectual Property (IP) developed in TCII research will belong to the TCII and be licensed directly by the TCII rather than by the partner universities. The TCII will derive revenues from research, teaching, philanthropy and licensing, and will cover its operating expenses including costs of space from these revenues.

The TCII will be led by a director, who will be selected by the Provosts of Cornell and the Technion. The TCII will be overseen by a joint governance board that will have authority over the financial and administrative aspects of TCII, subject to the authority of the boards of Cornell and the Technion. Tenure track faculty at the TCII will have their tenure track appoint-ments at either Cornell or the Technion, the TCII will not separately grant tenure.