ACADEMIC ALTERATIONS

The NYU Polytechnic School of Engineering is injecting its Brooklyn facilities with a refreshing shot of modernity.
Call for Nominations
Polytechnic Institute Alumni Association Seeking Nominations for Officers and for International Board of Directors (5 seats)

Polytechnic Institute Alumni Association Seeking Nominations for the following Officers for term 2015–2017:

PRESIDENT
EXECUTIVE VICE PRESIDENT
VICE PRESIDENT
TREASURER
SECRETARY

(5) Seats for the International Board of Directors for the term 2015–18

Potential nominees should have demonstrated service and leadership and display a strong understanding and commitment to the mission of the Alumni Association and the advancement of NYU Polytechnic School of Engineering.

Nomination deadline for the 2015 election is February 23. Make nominations in writing to engineering.nyu.edu/alumni/nominate or by mail to the Office of Alumni Relations, 15 MetroTech Center, Brooklyn, NY 11201

Learn more about the PIAA by visiting http://engineering.nyu.edu/alumni or http://engineering.nyu.edu/PIAA.

Back to School Day

The Office of Alumni Relations and the Polytechnic Institute Alumni Association are pleased to invite you to return to Brooklyn and your alma mater for our annual Back to School Day event, being held on Saturday, April 25, 2015.

We would like to extend a special invitation to the Class of 1965, as we celebrate the 50-YEAR ANNIVERSARY OF YOUR GRADUATION. If you are a member of the Class of 1965 and are interested in helping us plan a memorable event, contact Valerie Cabral, director of alumni relations at vjc1@nyu.edu.

Looking forward to seeing you on Saturday, April 25, 2015.

Come celebrate, reconnect with fellow alumni and revisit all your great Poly memories!

24 Transformative Process
The NYU Polytechnic School of Engineering is updating its look for the next age of discovery. From new classrooms with state-of-the-art technology to revamped study spaces in the library, some of your favorite old haunts are getting a much-needed makeover. Take a look back at the past and peer into the future with our photo essay.

30 The Digital Revolution is Here
The Governance Lab at the NYU Polytechnic School of Engineering is home to innovative minds determined to change the way public policy is approached and applied, using advances in technology and science. Read about how the Lab is proving that 21st-century citizen engagement can make a difference and learn more about co-founder and director Beth Noveck, who once served as the White House’s Deputy Chief Technology Officer.

34 Encouraging Progress Through Diversity
Professor of Chemical and Biomolecular Engineering Jin Montclare is busy inventing useful proteins with important applications in tissue engineering, drug-delivery, medical imaging, and more. She still finds time, however, to mentor young women and make sure they understand the world of possibilities that studying science, technology, engineering, and math opens for them.

38 Full STEM Ahead
The NYU Polytechnic School of Engineering’s Center for K-12 STEM Education is devising new ways to give students a leg up in science, technology, engineering, and math. Read more about the Center’s people and programs and find out why they’re making an impact not only here in Brooklyn but throughout the world.
Dear Alumni and Friends,

The one constant in engineering is change. While we take pride in being the school that educated James Wood (1879)—responsible for the machinery that produced the distinctive cables of the iconic Brooklyn Bridge—and Jasper Kane (’28)—who discovered a process to mass-produce penicillin, thereby saving more than a million lives during World War II alone—we take equal pride in our engineers who helped develop the world’s first integrated circuits, made enormous strides in biotechnology, and those who are at the forefront today of information technology and the much needed clean-energy solutions.

Everyone now knows engineers to be not merely the people who design bridges and skyscrapers but also the ones who make possible wireless communication, protein engineering, big data analysis, and a host of medical marvels that would have been inconceivable not long ago. Thanks to our Institute for Engineered Interfaces, Center for Advanced Technology in Telecommunications, Center for Interdisciplinary Studies in Security and Privacy, NYU WIRELESS, and Media and Games Network and the Games Innovation Laboratory, we are at the forefront of those fields and more.

But the face of engineering is changing in many other ways as well.

In this issue you will read more about Professor Jin Montclare, who is not only engineering protein microfibers but making it her mission to mentor aspiring women scientists and technologists. Thanks to her efforts, and efforts like hers, the face of engineering is sometimes a female one. You’ll read about our Center for K12 STEM Education, which is creating innovative educational programs for middle schools and high schools around the city and around the world. Thanks to the Center, the face of engineering is now sometimes also a young one.

Elsewhere in Cable you’ll read about the new Governance Lab, located at a MetroTech Center. You may never have thought that engineering and public policy shared a deep connection, but GovLab, as it is known, brings together those who design, implement, and study technology-enabled ways to increase civic engagement and solve public problems. The face of engineering can now be the face of every proactive and engaged citizen who seeks openness in governance.

As we celebrate the changes taking place in engineering, we can also celebrate the changes taking place right here at your alma mater. I encourage you to review the photo essay on the ongoing improvements being made to our facilities: classrooms renovated, well-equipped labs created, public areas made increasingly inviting, and more. But, of course, an institution is made up not only of its bricks and mortar but of its people, and I am thus happy to announce that a large and impressive new group of faculty members has joined us this year. Read about them in this issue and visit us to meet them in person when you have the opportunity. Your old professors will also, no doubt, be gratified to see you.

Our doors are always open to you, our dedicated alumni and friends. I am delighted that you have remained part of the changing face of the NYU Polytechnic School of Engineering.

Sincerely,

K.R. Sreenivasan

LETTER FROM THE PRESIDENT
A bat-filled cave in the mountains of Jinan, China, hardly seems like the right milieu for a Brooklyn-educated mechanical engineer-mathematician. “It really feels more like Indiana Jones territory,” Nicole Abaid, a 2012 PhD recipient of the school, says. Abaid traveled to that far-flung and colorful locale not to retrieve valuable coins or biblical artifacts but to leave infrared cameras and ultrasonic microphones. The goal: to gather data on how bats communicate.

Abaid’s inclusion in the 2014 “Brilliant 10” marks an historic circumstance: one of the very few times a “Brilliant” has been taught by a “Brilliant” from a previous list. In 2010, Maurizio Porfiri was dubbed the “Water Wizard” by the editors of Popular Science, who wrote, “The waters that cover about 70 percent of the Earth’s surface are basically unexplored. But underwater vehicle systems lag behind their surface counterparts in power (solar can’t be used in the deep) and communications systems (Wi-Fi doesn’t exactly crank through 300 feet of liquid). Porfiri’s lab could close that gap.”

If that wasn’t coincidence and connection enough, Abaid is joined on the 2014 list by Jonathan Venville, an NYU Polytechnic School of Engineering assistant professor of electrical and computer engineering. Venville was honored as a pioneer in a field of biomedical engineering that utilizes flexible electronics and for his design of implantable devices that allow active circuitry to sit directly on the surface of the brain with no tissue damage.

When it came to deciding which area to focus on, Abaid says, she “was very lucky,” Abaid says. “Maurizio Porfiri, in the Department of Mechanical and Aerospace Engineering, was doing math-oriented research, and when I got the chance to work with him, it proved life-changing. I was able to learn about the hugely diverse range of problems engineers tackle every day, which was really exciting.”

Abaid settled on mathematics, earning a bachelor’s degree in 2003 from the University of Kansas. When it came to decide her next move, however, she had something of an epiphany: engineering represented the intersection of math and real-world experience, and the NYU School of Engineering would be a great place to study it.

“I was very lucky,” Abaid says. “Maurizio Porfiri, in the Department of Mechanical and Aerospace Engineering, was doing math-oriented research, and when I got the chance to work with him, it proved life-changing. I was able to learn about the hugely diverse range of problems engineers tackle every day, which was really exciting.”

Porfiri (see sidebar) was doing groundbreaking work designing underwater robots that emulate real animal behavior, and it was, as Abaid calls it, “a rare experience” to work with him on mathematically modeling how fish move. Abaid earned her doctorate in mechanical engineering in Porfiri’s lab in 2012 and is now an assistant professor of engineering science and mechanics at Virginia Tech. Deeply involved in a K-12 education program called AMPs (Applying Mechatronics to Promote Science), while in graduate school, she remained committed to spreading a love of engineering to young people and currently organizes a LEGO robotics team made up of girls aged 9 to 12 from Blacksburg, where Virginia Tech is located. It might pay to keep your eyes on the “Brilliant 10” list about 20 years from now, one of those girls could be making an appearance if Abaid has anything to do with it.
AN ELECTRIFYING DEVELOPMENT
BotFactory Is Changing the Face of Circuit Boards

Modern technology is arguably spoiling us. Streaming allows us to see almost any film we want with just a couple of clicks; Amazon, Fresh Direct, and a plethora of other companies deliver goods right to our doors; and we can snap, edit, and send photos with a few swipes on our smartphones. So in this day and age, why should an electrical engineer wait 10 days and pay $250 to create a prototype circuit board?

BotFactory is a startup devoted to revolutionizing the process with a product they call Squink—the name is an amalgam of “squeeze” and “ink”—a personal electronic circuit factory that can produce a prototype board in about 30 minutes for under $5. Squink can be used by experienced designers to accelerate their development cycle and also empowers communities with limited access to fabrication services. (Because components are glued, rather than soldered, even children can produce a working prototype.)

Nicolas Vansnick (POLY-ENG ’13), co-founder and CEO, and Carlos Ospina (POLY-ENG ’14), co-founder and CTO, are graduates of the NYU Polytechnic School of Engineering, and the pair met their third co-founder, Professor Mike Knox, back when they were students. Knox—part of a program called Faculty Engineers in Residence, which connects budding entrepreneurs to teachers with business experience—had mentored the two when they entered the initial version of Squink in the school’s Inno/Vention contest, where it placed in the hardware category, and decided to join them in their enterprise. BotFactory’s connections to NYU run even deeper, however: it is housed at the DUMBO incubator, one of three such facilities maintained by the School of Engineering.

Hoping to begin manufacturing units on a larger scale, the company recently mounted a Kickstarter campaign that raised more than $100,000 in pledges with the help of 260 backers. While a handful had pledged $9,999 or more, the vast majority had promised $50 or less, probable evidence that the project enjoyed widespread support among students and amateur inventors—the very audience of consumers they’re addressing with Squink.

ILL SCHMIDT can speak with authority on any number of interesting topics—from industrial and financial history (he has amassed a museum-quality collection of antique stock certificates) to protein crystallography (he focused on the area while earning his PhD from the University of Virginia Medical School in 1975). He speaks with special passion about one particular topic, however: his parents. “They were saints,” he says emphatically.

His father, William C. Schmidt, had lost his own father early on. “He was just 14 at the time,” Bill Schmidt relates, “so he didn’t get to have much of a childhood, and he worked hard as a bag boy at a local market to help support his family.” Those responsibilities did not prevent him from focusing on his high school studies, and after graduating in 1947, the elder Schmidt got a job in the mail room of AT&T, thanks to a sister who already worked at the company. Following a full day of sorting and mailing mail, he attended evening classes at what was known at the time as the Polytechnic Institute of Brooklyn and then took the long train ride home to Carlstadt, New Jersey. “His days started well before 7 a.m.,” Bill Schmidt says, “and he had an incredible work ethic in the face of grueling demands.”

After earning a BS degree in electrical engineering in 1957, William Schmidt remained at AT&T, where he focused on increasingly miniaturizing circuit boards. An invertebrate researcher, he held several patents and had little interest in moving into a management spot. “By the mid-1970s, when he retired, he was probably making no more than $25,000 a year,” Bill Schmidt recalls. “But he made sure we had everything we needed and more.” In addition to being a good provider, Schmidt was a devoted husband and father, who delighted in restoring antique automobiles and building a scale model live steam locomotive with his son.

He also never forgot his alma mater and how the degree he worked so hard to earn had enriched his life. He thus became a member of the Samuel B. Duryea Society, which recognizes those who have named the School of Engineering as a beneficiary when planning their estates. Bill Schmidt, wanting to honor the bond his father had forged, has also made generous provisions for the school and is himself a member of the NYU Society of the Torch.

And although he maintains a hectic schedule writing articles for such publications as Financial History and Manuscripts, sitting on various boards, conducting historical research, and organizing his impressive collection, Bill Schmidt is never too busy to extoll the virtues of one of the men he admires most in the world. “My father led an exemplary life and had very solid values,” he says. “Wanting to give back to his alma mater was very typical of him.”

For more information about planned giving or joining the Samuel B. Duryea Society, please contact Judy Sager, Associate Dean for Development and Alumni Relations at jsager@nyu.edu.
REACHING FOR THE STARS
A Trio of Astronaut Alums Come to Brooklyn for NYU’s Annual Speakers on the Square Series

“It’s definitely the blue jumpsuits,” Lee Morin joked. “If we took these off, we’d fade into anonymity.” Morin was speaking while shaking hands, signing autographs, and posing for cell-phone photos with excited fans who had come out to hear him speak, along with fellow astronauts Charles Camarda and Paolo Nespoli, at “Speakers on the Square...Astronauts in Brooklyn,” an event sponsored by the NYU-Poly Alumni Association (PIAA), as discussion moderator—have logged 200 days in space during a variety of missions, which have included, in the case of Nespoli, a 159-day stay at the International Space Station.

Collectively, Camarda, Morin, and Nespoli—who were joined on stage by Lockheed Martin aerospace engineer Nicholas Mitchell (POLY-ENG ‘94) as discussion moderator—have logged 200 days in space during a variety of missions, which have included, in the case of Nespoli, a 159-day stay at the International Space Station.

The group was introduced to the audience by Dean Katepalli Sreenivasan, who, despite ultimately deciding on [what was then known as] Brooklyn Poly, he said during his acceptance speech. “It was close to home and low cost, and they had a reputation for post-WWII radar and radio research. Little did I know I would have Henry Honcharenko as my professors ... all those engineering textbooks on communication theory and electromagnetics were written by these guys!”

His alma mater, Honcharenko acknowledges, provided the launch pad that allowed him to soar in his field. “I was accepted to many Ivy League schools, but ultimately decided on [what was then known as] Brooklyn Poly,” he said during his acceptance speech. “It was close to home and low cost, and they had a reputation for post-WWII radar and radio research. Little did I know I would have Henry Honcharenko as my professors ... all those engineering textbooks on communication theory and electromagnetics were written by these guys!”

Alum Walter Honcharenko Is Awarded the Highest Honor Given to a Member of the Alcatel-Lucent Technical Community

“In sixth grade, I ran an antenna wire around my classroom,” Walter Honcharenko (POLY-ENG ’89, ’93) recalls. “My teacher thought I was crazy, but we were able to receive an AM news broadcast on a crystal radio wound on an oatmeal container. Later, in high school, I was the one in the background at the one and only school radio station in NYC. WHIL Radio 680 on the AM dial, turning the knobs and fixing the turntables.”

Honcharenko has moved well out of the background since then. In November 2013, he was front and center at the ceremony celebrating the new class of Bell Lab Fellows, being feted for his major contributions to the company’s radio and power amplifier technology and architecture. Being named a Bell Labs Fellow is a rare honor; only a handful are chosen each year, and the selection process is lengthy and exhaustive. The multi-page form submitted by his enthusiastic nominator includes the assertion that Honcharenko “is widely recognized as THE expert in the area of digital pre-distortion and radio signal processing not only in the company but in the industry at large” and concludes, “Perhaps the highest compliment one can pay Walter is that he is a ‘blue-collar’ Ph.D.; that is, not only does he possess a brilliant theoretical technical background, but he also knows how to apply it in working with ‘real-world’ products.”

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His fans at Alcatel-Lucent are awaiting Honcharenko’s completion of a book on technical achievement and being a vital asset to one’s company.
Sal DePrisco (POLY-ENG ’82) knows full well the value of a degree in chemical engineering. Although he graduated during one of the worst economic recessions in recent memory, he immediately received multiple job offers. He settled on a position with General Foods, working as a Process Engineer in the Plant Engineering Department of Maxwell House Coffee, at the Hohokus, NJ, facility. “A million pounds a day were processed there,” he says. “And as a typical kid of the Space Age, growing up fascinated by how things worked, I found it was a terrific place to work.”

DePrisco, who later launched his own consulting company, Sensible Technical Solutions, is now focusing on a liquid phase engineering project. “But salt water is insidious. It’s highly corrosive, and it doesn’t matter if it’s touched a surface for 30 seconds or 30 hours. The damage will lay latent, and can manifest months, or even years, later but it will occur.”

By the end of the first phase of the project, Sensible Technical Solutions had uncovered hundreds of millions of dollars of hidden damage that PanNYNJ and the Federal Emergency Management Agency (FEMA) had not found. DePrisco is looking forward to a new phase of follow-up, which may lead, he strongly hopes, to standards for recovery from salt-water inundation that could be used on a national level. “It’s important that our infrastructure not only get back to pre-disaster condition, but that it be even more resilient in the future,” he asserts.

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**A WINNING SPEAKER**

John Trani Addresses the Engineering and Technology Forum

There are many ways to describe John Trani: alum, successful businessman, generous Promise Scholarship supporter, operating partner of the evocatively named private-equity firm Stonepeak, protege of the legendary Jack Welch, former president and CEO of GE Medical Systems, and one-time chairman and CEO of The Stanley Works, among them. The descriptor that arguably go at the very top of that list is, however, straight shooter.

On September 22, Trani (POLY-ENG ’57, STERN ’78) returned to the School of Engineering to address Professor David Lefer’s Engineering and Technology Forum, which introduces new students to the core concepts of invention, innovation and entrepreneurship. In the 1980s a straight-shoot ing Trani had famously rescued GE’s ailing Mobile Communication Division, which had lost some $40 million in the years before his appointment; under his leadership the division quickly generated $42 million and was ultimately sold for $274 million—a turn-around that Jack Welch called, at the time, the most impressive in GE history. Trani opened his Forum lecture by succinctly outlining the three-pronged attack that made such a feat possible: simplify the business, restore operating effectiveness, and become competitive.

Those lucky enough to be in the audience received a primer on running a business in the real world. Among the lessons that should be gleaned from his time at GE, he explained: organizations are resilient and find people who can deliver, because while the brilliant idea is important, executing it is magnitudes more important.

Trani also gave “tips from the top,” such as differentiate yourself, be an achiever not a talker; measurements matter, so know the score; learn from both failures and successes; be a team player; don’t let money be your prime motivation, but don’t sell yourself short either; and lead and Engineering to address Professor David Lefer’s Engineering and Technology Forum, which introduces new students to the core concepts of invention, innovation and entrepreneurship.

**MASS APPEAL**

Primex Honors Alum John Farber with the Naming of Its Technology Center

Since graduating from what was then known as the Brooklyn Polytechnic Institute, John Farber (POLY-ENG ’57) has enjoyed a long career in the chemicals industry. After joining his father-in-law at the Leslie Klyman Corporation, a small import-export business, he formed a chemical trading division for the company, sourcing ingredients for the paints that his family once made in Romania. That company later became ICC Industries, parent to the Primex Plastics Corporation. Farber has been honored frequently; in 2005, for example, he was given the Sesquicentennial Medal commemorating the school’s 150th anniversary. Unlike that medal, his latest laurel is far too large to hang on a ribbon. It is, in fact, an entire building.

Primex recently announced that they have named a new technology center in his honor. The company officially cited his business acumen, leadership skills, and devotion to science as pivotal factors in their decision.

**THE NOSE KNOWS**

A Master’s Student from the NYU Polytechnic School of Engineering Devises a Better Method of Lie Detection

Cesare Lombroso, an Italian criminologist, created the world’s first lie detection device at the end of the 19th century. Modifying an instrument called a hydrophygmograph, which measured blood flow by means of a fluctuating column of water, he recorded the changes to pulse and blood pressure that occurred in a suspect during a police interrogation. While many of his views have since been discredited—he believed, for example, that jaw size directly correlated to criminal tendencies—his assertion that the physiological changes accompanying lying could be measured and used by law enforcement officials formed the backbone of contemporary lie detection.

In 1912, about a decade after Lombroso’s death, Canadian psychologist John Larson developed what is generally acknowledged to be the first modern polygraph instrument, adding the means to measure respiration in addition to blood pressure and pulse. Except for the introduction of computer components, little has changed since then.

Polygraph testing still not only requires expensive, non-portable hardware, its accuracy rate could unquestionably be better. (Research has shown an average of just 83% accuracy.) Add to that the fact that many people now know how to fake the results of their test by controlling their breathing and heart rate. Yaniv Azar, studying for his master’s degree in electrical engineering, turned his focus to the problem of better lie detection. He was excited to learn that the previous year, in 2012, Spanish researchers had found that when a person lied there was an increase in the temperature around the nose and in the orbital muscle, due to increased blood flow to an area of the brain called the insula, which is activated during periods of heightened emotion—the so-called “Pinocchio Effect.”

Azar approached Professor Matthew Campisi, renowned for using a technique called thermography, which produces an infrared image that shows the patterns of heat and blood flow in tissue, for the early detection of breast cancer. “Professor Campisi was a terrific resource,” Azar says. “We did a lot of brainstorming and planned an experiment in which we would heat our subjects in front of an infrared camera and take images while asking them a series of easily answered questions, for example, their names. Sometimes they were instructed to lie and sometimes to tell the truth.”

Using a proprietary algorithm that he hopes to one day patent, Azar was able to correlate the infrared images and the incidents of lying with a high degree of accuracy—fully 95%. He points out, additionally, that infrared cameras are relatively cost efficient, portable because they require no wires, and non-invasive because a subject need never touch the camera or its operator.
ACADEMIC YEAR WELCOMES NEW FACES, AND NOT JUST STUDENTS

Introducing the Newest Members of Our Faculty

“If we are to make a difference in the world, we must first make a difference in our own lives,” said Assistant Professor Michael O’Neil. “Institutions are much more than bricks and mortar,” Dean Katepalli Sreenivasan said on September 8, at a gathering in honor of the NYU Polytechnic School of Engineering’s newest faculty members. “They are also made of people and ideas. Thanks in part to our new faculty members,” Sreenivasan said, “we are going to be an even more vibrant, interesting, and exciting place.”

Future issues of Cable are sure to have more in-depth coverage of the cutting-edge research, stimulating teaching, and valuable mentoring being done by those who joined us in the fall of 2014, but in the meantime, read on for a brief introduction.

Industry Professor Sergio Bianchi comes to the Department of Finance and Risk Engineering from the University of Cassino in Italy. His research interests mainly concern the modeling of stock markets by means of (multi)fractional stochastic processes. In this field, his specific contributions concern the dynamical estimation of the regularity exponent.

Assistant Professor Weiqiang Chen of the Department of Mechanical and Aerospace Engineering has been the recipient of the American Heart Association’s Young Investigator Awards. He is currently working on developing new methods of cultivating stem cells that is expected to open up myriad possibilities for regenerative therapies and drug treatments.

Lecturer Michael D’Eme of the Department of Technology Management and Innovation has decades of experience in financial management, having worked for the American Stock Exchange and International Monetary Fund.

Assistant Professor Emilie Dresseaux, one of the newest members of the Department of Mechanical and Aerospace Engineering, is focused on understanding and manipulating systems in which particles, interfaces and fluids interact in fascinating and complex ways.

Assistant Professor Siddarth Garg of the Department of Electrical and Computer Engineerin is doing exciting work on the safety, reliability, and efficiency of computing devices. He is particularly interested in how electronic components can be designed and manufactured securely and how power consumption can be better controlled.

Lecturer Tom Helling of the Department of Technology Management and Innovation has done pro bono work with a number of entrepreneurial ventures in the media and sustainability space. He is primarily interested in sustainability-oriented innovation and eco-innovation, in both for-profit and not-for-profit organizations.

Industry Associate Professor Deborah Kletenik, an alum of the School of Engineering, has joined the Department of Computer Science and Engineering to teach “Introduction to Programming and Problem Solving.” Her own research, which focuses on machine learning, explores how to reduce the costs of using Boolean classifiers.

Assistant Professor Constantine Kontokosta has explained that new ways of collecting and analyzing urban data are helping advance a fundamental understanding of the science of cities—an area that requires interdisciplinary focus bridging engineering, data science, and the social sciences. Kontokosta has been at the forefront of this field, serving as the Deputy Director of NYU’s Center for Urban Science and Progress (CUSP) since its launch, and he now joins the Department of Civil and Urban Engineering.

Lecturer Peter Li works in the General Engineering Program and is himself an alum of the school. He also advises the oSTEM @ NYU club, which is dedicated to educating and fostering leadership for Lesbian, Gay, Bisexual, Transgendered, Questioning, and Allied communities in the science, technology, engineering, and math (STEM) fields.

Assistant Professor Michael O’Neil is one of the newest faculty members of the Department of Mathematics, with a joint appointment at the Courant Institute. His research focuses on the partial differential equations (PDEs) of classical physics, for example, those that arise when working with electromagnetics, acoustics, heat flow and other such areas.

Assistant Professor Davood Shahjadi, a new member of the Department of Electrical and Computer Engineering, is studying solid-state materials that are shrunk to extreme nanoscale with the aim of creating new paradigms in solid-state nanoelectronics for sensing, energy harvesting, and energy-efficient computing, among other areas. He was named an IBM Master Inventor in 2013 and has more than 100 publications and patents to his credit.

Industry Associate Professor Jim Wieckard of the Department of Mathematics focuses on information processing in early sensory pathways in mammals, particularly on its role in perception, cognition, and consciousness. Using detailed large-scale computational simulations, his work aims to contribute to our understanding of sensory decision-making in the brain.

The NYU School of Engineering also welcomes a host of wonderful visiting faculty. They include Narges Mousavi, Simon Niven, Beth Noveck, who is the Jerry Hultin Global Network Visiting Professor in Entrepreneurship, Zhigang Shen, and Beth Noveck, who is the Jerry Hultin Global Network Visiting Professor in Entrepreneurship.
I n 2006, when Erich Kunhardt was named provost and chief academic of- ficer of what was then called Polytechnic University, a cov- er story in Cable trumpeted, “New Provost to Spur Inno- vation and Invention at Poly.” Kunhardt, who had earned a doctoral degree in Electro- physics from the Stevens Institute of Technology, in Hoboken, NJ, while at Stevens he and his colleague Kurt Becker (now Vice Dean for Academic Af- fairs at the School of Engineer- ing) had invented and patented a method of gener- ating and stabilizing cold atmospheric-pressure plas- mas, an invention which was the basis for the formation of two start-up companies, the Plasmation Corporation and the Plasmolab Corporation. Ultimately, Kunhardt and Becker would hold more than a dozen patents. Plasmolab was soon winning major contracts for decontamination and sterilization applications from the U.S. Army, DARPA, and NASA and was eventually acquired by Stryker Instruments for $35 million.

Once he arrived back at the School of Engineering in 2006, Kunhardt, who had been born in the small town of Muster, Civil, in the Domin- ican Republic, in 1949, found a kindred spirit in then- Pres- ident Jerry Hultin. Together, the two formulated a philoso- phy and motto that has been a hallmark of the school ever since: Innovation, Invention, and Entrepreneurship (or in, as it was generally known). During his three-year tenure as provost, Kunhardt played a central role in the ne- gotiations with NYU that re- sulted in the agreement that led to the recent merger of the two institutions. He spent his final years here doing what he arguably loved most—engag- ing in research and teaching bright, young people.

For Kunhardt, invention, innovation and entrepre- neurship had a higher pur- pose. “I have always tried to join two very divergent per- spectives,“ he said back in 2006. “One is touching God and understanding the basic elements of nature and the other is touching humanity or how to make life comfort- able for humans.”

Despite Kunhardt’s death, on August 4, 2014, genera- tions of students will contin- ue to gain that duel perspec- tive, thanks to the ethos he fostered and the lasting legacy he left.


daroof educ microchange the face of the school

In 1991, when Erich Kunhardt’s
told the reporter, “I want to
obtain my Ph.D. in Electro-

Evolution and Invention at Poly.”

New Provost to Spur Inno-

vation and Invention at Poly.

BROOKLYN BUZZ

drumeters, he had served as

ficer of what was then called

Polytechnic University, a cov-

f the world.

 mobility to change the world.

invention and entrepre- nuterprise and creativity. Desai—

4 million. Kunhardt

and NASA and was eventually

known). Kunhardt

and Unable to Attend.

the support of Professor Eng-

yVulfson and Associate Dean

for Special Projects Brad Penuell and the generous sponsorship of the Department of Technology

management.

Among Desai’s ideas are an

novation space, where stu-

tudents could collaborate and gain

hands-on experience creating

prototypes; an annual i2e show

 prototypes; an annual i2e show-

designed to educate himself, he
discovered a text-

book called Using Energy and

subsequently built a 5-meter windmill from scrap materi-

, which he used to power

light bulbs and a radio for

his family and charge his

neighbors’ mobile phones. In-

roduced to the Western

world by the head of a Malawi

NGO, Kamkwamba has since

orved as an inaugural

he was understandably excited. “Students can make a dif-

ference—one on our campuses and in the world,” he says.

“The other Fellows and I shared

our ideas about how to build

a culture of innovation at our

schools, and the enthusiasm

was infectious. I want to infuse

everyone here at NYU with sim-

ilar zeal, and if all the Fellows do

the same, we can spread a real

epidemic of innovation and en-

trepreneurship.”

It’s a fitting metaphor, De-

sai—who earned his undergrad-

uate degree at the Vellore Insti-

tute of Technology, in India—is a past president of the ACS. It

was, he later said, like meeting

a rock star. Thus was born the

idea for a new ACS initiative, and

in August, at a national meeting

held in San Francisco, the group

honored Pearce as an inaugural

Rock Star of Chemistry.

Pearce, who studied with

such luminaries as Herman Mark and Charles Oberberger,

power play

ELI PEARCE:

ROCK STAR

When the American Chemical Society (ACS) held its national meeting and exposition in Dall-

las in early 2014, one of the young

attendants became very excited to

spot Eli Pearce, a research professor at the NYU Polytech-

nic School of Engineering and

INSPIRATION, DETERMINATION

HOW TO NURTURE A CULTURE OF INNOVATION AND ENTREPRENEURSHIP

New University Innovation Fellow Sarth Desai Is Focused on Constructing an NYU-Wide Community of Design Thinking and Ventures Creation

When Sarth Desai was chosen by the National Center for Engineering Pathways to Innovation (Epicenter) as a University Innovation Fellow and attended his first gathering of Fellows from across the nation, he was

along with some of the more

refined educational opportuni-

ties across NYU.

If you’re unfamiliar—why those things are so important, Humera Faushuddin, leader of the University Innovation Fellows program for Epicenter, explains, “It is so critical for stu-

dents to have an entrepreneur-

ral mindset in today’s economy. They need more than just tech-

nical skills to solve the big prob-

lems our world is facing.”

STEM activities, see page 38.
and hosted by its members and partners. Steel Day events—including tours, presentations, and open houses—are organized all over the country, making it the industry’s largest educational and networking function.

Thanks to the efforts of Professor Lawrence Chiarelli and the Department of Civil and Urban Engineering, more than 100 attendees gathered at the School of Engineering on September 16 to hear a presentation from the developers of 2 City Point—at 1.8 million square feet, the largest mixed-use center in Brooklyn. Most important to those celebrating Steel Day, the center will include the tallest building in the world constructed using an innovative steel framing system called the Girder-Slab® System, which is less costly and quicker to erect than typical cast-in-place concrete systems. (Dan Fisher, the head of Girder-Slab®, was on hand to explain the proprietary technology and address questions from attendees.)

Holding the event at the School of Engineering allowed students to mingle with and learn from industry experts. “Everyone was particularly impressed that the students asked such intelligent questions,” Jacinda Collins, an AISC official, says. “They were bright, enthusiastic, and a pleasure to meet, and their presence added immeasurably to the success of the event.”

A highlight of the day was the chance to don hard hats and actually tour the project, which is located within blocks of the MetroTech Center. “That proximity made the School of Engineering the ideal spot for the gathering,” Chiarelli says. “And any opportunity we have to strengthen our friendship with the AISC, which also co-sponsors the National Student Steel Bridge competition in which our students take part each year, is very welcome.”
ROBOTS ROVING THE GOWANUS
With the Help of Citizen-Scientists, School of Engineering Researchers are Monitoring the Health of the Superfund Site

The Gowanus Canal is an unwelcoming place for a human divider. Named a Superfund site by the Environmental Protection Agency (EPA) in 2010, the almost-two-mile-long waterway was deemed one of the most polluted in the nation, thanks to decades as a dumping ground for industrial run-off and raw sewage. One year ago a healthy baby whale blundered into the canal and was almost immediately covered in sludge, it died within days, providing a stark warning to any living creature who might think of venturing into the lead- and mercury-tainted waters.

How, then, could anyone think of harnessing the power of citizen-scientists. Anyone can now register on the site and begin tagging photos. “Our citizen scientists are helping us immeasurably,” he says. “It doesn’t take any formal training, but the information they’re providing is absolutely essential to our efforts to monitor conditions in the canal and track its cleanup.” And while you’re at it, he adds, if anyone has an idea for a better name, the team would like to stop referring to their aquatic robotic vehicle by the admittedly unexciting moniker Brooklyn Atlantis II. “Maybe we could have a contest and give a small prize for the best idea,” he muses. One thing is quite certain—Brooklyn Atlantis II is making important contributions to the health of the Gowanus Canal, and that’s a winning proposition for all New Yorkers.

To learn more or to register, visit www.brooklynatlantis.org.

A PANORAMA FROM THE CAMERA ATOP BROOKLYN ATLANTIS II

TINKERING AROUND... WITH A MISSION
Students Devise an Award-Winning Way to Empower Women

Everyone knows that engineering schools can train students to provide communities with potable water and sturdy bridges. But what happens when they’re asked to help solve other types of complex social questions? Associate Professor Anne-Laure Fayard’s Design-Thinking Class and the Design Tinkering Club, which she advises, regularly take part in OpenIDEO, an open innovation platform that asks the public to brainstorm solutions to a wide variety of important social issues.

This past year Fayard’s students tackled the question of how to make low-income urban areas not only physically safer but more empowering for women and girls. Their ideas demonstrated the school’s commitment to producing creative, deep-thinking, problem-solving professionals, no matter what their major. Students from Design Tinkering proposed to identity and train female leaders in low-income urban areas: these community “concierges” would gather and share information and connect other women across their communities. The students involved are currently collaborating with Women for Human Rights (WHR), a Nepal-based NGO, to prototype and pilot the idea of providing women in Kathmandu slums with a training program encompassing leadership skills, health, and craft.

That idea attracted considerable attention and was one of only five selected to receive funding from Amplify, a program of the British Department for International Development (DFID). (Almost 600 ideas from around the world had been submitted to the Challenge.) The Design Tinkering students are also developing a downloadable open-source toolkit for other NGOs, as well as a web documentary to raise funds for making the program sustainable after the pilot phase.

“Collaborating with WHR in Kathmandu gave us the chance to have an impact on the life of women in the slums,” Fayard says. “Getting their input on our original idea, the design of the badge, and the content of the training have been crucial in the development of a program which, we hope, can really empower these women socially and economically. This project proves that our club, if we needed proof, can develop and implement innovative solutions that address important social issues.”
A TRIFECTA OF NSA HONORS

There was good reason to celebrate early in August, when the NYU Polytechnic School of Engineering was officially honored as a National Center of Academic Excellence (CAE) in Cyber Operations by the National Security Agency (NSA). The school was the first in New York to earn that prestigious designation, which will be limited to just 25 institutions across the country, and it is now one of only a handful to have earned all three CAE designations, having been previously named a CAE in Information Assurance Education and a CAE in Information Assurance Research.

The newest laurel, signaling that a school boasts a deep, technical, interdisciplinary program with extensive opportunities for hands-on learning, was presented at a celebratory luncheon by Steven LaFountain, the Distinguished Academic Chief for Information Assurance and Cyber in the Associate Directorate for Education and Training (ADET) at the NSA.

Speaking to the attendees following the presentation, Professor Nasir Memon excitedly outlined his vision for the future of cybersecurity studies at NYU. “We’re thinking of instituting an undergraduate cybersecurity degree in addition to our graduate program,” he explained, “and one day we plan to have industry leaders in residence, much like some schools have artists or writers in residence.” He also stressed the need for industry to partner with academia. “Businesses will need the next generation of experts we are educating,” he asserted. “There is a strong case that now is the time for collective action.”

The Max Planck Institute for the Science of Light held a workshop on bioassaying at the very smallest extremes, during which research developed at the NYU Polytechnic School of Engineering played a key role. Professor Stephen Arnold presented his research on the Whispering Gallery Mode Resonator at the molecular level. Associate Professor Iwao Teraoka, who collaborated in early work on the Whispering Gallery Mode Resonator, was invited to present research on a new biosensor that he is developing.

Springer Science+Business Media, a leading global scientific, technical, and medical publisher, has selected NYU Polytechnic School of Engineering Professor of Applied Physics, Professor of Mechanical and Aerospace Engineering, and Vice Dean for Academic Affairs Kurt H. Becker for two editorial positions. He will serve on the Board of Editors of the European Physical Journal ST (Special Topics) and will be a series editor for Graduate Texts in Physics.

Assistant Professor of Computer Science and Engineering Justin Cappos has introduced PolyPasswordHasher, an open-source password protection scheme for institutions and corporations that offers an unprecedented level of security for password servers, making it immensely difficult for hackers to decode even small numbers of individual passwords. PolyPasswordHasher is being tested as part of the Password Hacking Competition, a global effort organized by security professionals to improve security practices.

NYU Polytechnic School of Engineering Associate Professor Nikhil Gupta has developed a fiber-optic sensor that provides a safe way for engineers to closely monitor and durability of the composite materials used in aircraft and spacecraft. The patented extensometer is exceptionally sensitive, able to detect a single micron in displacement. Earlier this year, Gupta earned a second patent for a method of using his device, which works by sending out a beam of light and measuring how much passes through the material being tested.

This September, research on persistence by three members of the NYU Polytechnic School of Engineering Computer Science and Engineering faculty will receive the best paper award at the European Symposium on Algorithms in Wrocław, Poland. Professor John Iacono, Postdoctoral Teaching Fellow Özgür Özköz, and Postdoctoral Researcher Pooya Davoodi authored the paper, along with Jeremy Fineman of Georgetown University. The European Association for Theoretical Computer Science (EATCS) chose their paper, “Cache Oblivious Persistence,” from more than 250 submissions to the symposium.

Assistant Professor of Mechanical Engineering Joe H. Kim of the NYU Polytechnic School of Engineering has won a three-year, $350,000 National Science Foundation grant to develop a novel joint-based method of modeling and computing human metabolic energy expenditure. In addition, his paper, “Joint-Space Dynamic Model of Metabolic Cost with Subject-Specific Energetic Parameters,” has been accepted as a poster to The Advanced Modeling and Simulation Technical Committee 2014.

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New research in quantitative finance indicates that the wealth divide in financial markets may be both mental and structural—not a matter of large investors’ access to faster computers for stock trading or a factor of their personal connections. In a paper to appear in Quantitative Finance, NYU Polytechnic School of Engineering Professor Charles S. Tapiero examined a classic financial pricing model in which investors were not financial equals. His analysis showed that investors big enough to affect a market hold an arbitrage advantage.

The National Bureau of Economic Research (NBER) is an independent research institution in economics founded in 1920 and supported by contributions from corporate sponsors, foundations, and individuals. The NBER is dedicated to the production, distribution, and dissemination of economic knowledge. To learn more about the NBER, visit www.nber.org.

The premiere conference for data visualization will feature eight research papers co-authored by NYU Polytechnic School of Engineering faculty members from the Department of Computer Science and Engineering. The papers will be presented at the IEEE (Institute of Electrical and Electronics Engineers) VIS 2014, which will be held November 9–14, 2014, in Paris, and includes conferences on Visual Analytics Science and Technology (VAST), Information Visualization (InfoVis), and Scientific Visualization (SciVis).
The NYU Polytechnic School of Engineering and its home in the MetroTech Center—dreamt up by Brooklyn Borough President Howard Golden and then Polytechnic University President George Bugliarello in the mid-1970s—have experienced profound transformations through the decades. Where there were once elevated train tracks for the Myrtle Ave. El, there now lies a bustling four-lane road; Rogers Hall, once the site of a razor factory, now houses some of the most exciting engineering research going on in the country.

Since 2010, the then-named i2e Campus Transformation has been reshaping and updating the School of Engineering with projects like outfitting newly acquired academic spaces at Two MetroTech to the opening of the Center of Innovation for Technology and Entertainment (CITE) to renovating restrooms and corridors. This year, a new phase has begun: Let us take you on a tour of the most exciting improvements and changes happening at the NYU Polytechnic School of Engineering.

The Dibner Building, home to the Bern Dibner Library and built in 1991 at MetroTech Center, is at the heart of intellectual life at the NYU School of Engineering. Dedicated in 1992 in honor of alum Bern Dibner, the library is a buzzing landscape of young engineers and innovators day and night. Recently the space has experienced a profound transformation: Most stacks have been removed, with the material digitalized or available by request, and the floor packed with more study spaces, new computers, and a flood of sunlight from the windows. Seating capacity has increased by nearly 30% to include 294 new workstations with power outlets for charging electronic devices, carrels for individual study and tables for groups, and the space has been revised with fresh furnishings, carpeting, and paint.
When the massive Rogers Hall was converted from the American Safety Razor factory to an academic building able to house most services for what was then known as Polytechnic Institute of Brooklyn in 1958, things like laboratories and classrooms were at the forefront of the minds of administrators and planners. Since then, the building has gone through several iterations, and currently houses many academic departments, the cafeteria, undergraduate academics, the STEM center, and the gymnasium, among other facilities. This year, high-impact projects have taken the building into a new era of research, learning, and student engagement with renovations to dining rooms, hallways, classrooms, and windows.

HIT THE BOOKS
Classroom renovations on the 2nd floor of Rogers Hall revamp academic life

When construction of six new classrooms and upgrades to six existing rooms began this year it meant a few things: Moving classrooms to lower floors would alleviate demand on the building’s elevators by allowing students to use the stairs; lab renovations could begin on upper floors; and the classrooms themselves would welcome new furniture, flooring, windows, and paint, along with “smart” audio/visual systems and new lecterns. Improvements to corridors and hallways—including new sound-absorbing wall-structures and a lounge for students—extend the feeling of transformation outside the classroom.

READ IT HERE
The “Our Authors” publication display enlivens the first floor of Rogers Hall and the minds of aspiring engineers

This year a nearly 40-foot-long display with striking environmental wall graphics was installed on the first floor of Rogers Hall directly outside the cafeteria, where more than 80 publications from the school’s faculty are on view in a couple of contemporary display cases with embedded LED lights.
The transformation doesn’t stop there. In 2015, construction is expected to begin on labs on the upper floors in Rogers Hall for the new faculty hires. In the basement, a new student health center, which will incorporate counseling services, begins this fall. Coming up next year, the building will see Phase II of its window replacement project.

Nearby, Dibner Library will see the renovation of its fourth floor, which could include a new conference center, more collaborative study rooms for students, and an expansion of academic spaces.

Across the commons, historic Wunsch Hall began renovation in October of this year to house Graduate Admissions, Undergraduate Admissions, and the Wasserman Center for Career Development.

There’s even more to come in the distant future. We hope you’ll stop by for a visit to witness it firsthand.
THE DIGITAL REVOLUTION IS HERE

THE GOVERNANCE LAB IS HOME TO INNOVATIVE MINDS DETERMINED TO CHANGE THE WAY PUBLIC POLICY IS APPROACHED AND APPLIED

THE BAT CAVE: If you weren’t looking for it, you might walk past the new Governance Lab without even seeing it. GovLab headquarters moved into Two MetroTech at the NYU Polytechnic School of Engineering in September, setting up in an open, concrete-floored space at the end of a narrow, unadorned hallway that is soon to be totally renovated (see “Transformative Process” on page 24); a handful of arrows printed on foam-core quietly announced its arrival. But what many people don’t notice might be one of the most exciting experiments in public policy today—an “action research” organization focused on facilitating innovations in governance at the intersection of law, policy, and technology that improves people’s lives.
“It’s a secret, underground opera- tion of brilliant thinkers and doers trying to imagine, test and deploy the bottom-up solutions that every government needs, even if they don’t realize it yet,” notes one online participant in “Solving Public Problems Through Technology,” the flagship course offering of the Academy, the part of GovLab devoted to educational and training offerings to both degree students and public officials.

Okay, so it’s not actually a secret, or un- derground. It’s on the ninth floor and looks more like a tech startup than a Bat Cave. But the people here are rethinking the big- gest problems facing the world today, using emerging technologies, public data, and civic engagement. They’re partnering in innovative ways with students, as well as civic leaders and entrepreneurs, to build pools to improve healthcare, prisons, immi- gration, elder care, literacy, and more.

The common thread running through it all can be found in the name: governance. What does governance mean—more impor- tantly, what can governments be— in a technologically advancing, information-orient- ed, and socially networked world? Quite simply, how can technology create a more open and representative government?

Experts warn that the effects of climate change will soon be the cause of as many as 250,000 deaths per year. The British Medical Journal said that the much- discussed death toll of this year’s Ebola outbreak will “pale into insignificance when compared with the mayhem we can expect for our children and grandchildren if the world does nothing to check its carbon emissions.” John Farrell, an NYU law student, hopes that his team’s project will give people “a platform for education and action on climate change” in their everyday lives. The specifics of the project are still being hammered out, but one possibility is a tool for consumers to gauge the impact of green choices or purchases they make. The opportunity to develop it at the Academy has Farrell feeling optimistic. “My partners and I have talked about pursuing this [idea] for a long time,” he says. “This course has presented us with the structure to realize the idea. Everyone at GovLab has helped to push and direct us towards our final goal.”

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Moving Mountains

“Every survey will tell you that the rate of trust in government is declin- ing,” says Beth Noveck, the GovLab’s Co-Founder and Director. “People are actively banding to- gether to express these concerns—just think of Occupy Wall Street, the Arab Spring, the Climate March. But we don’t have a clear concep- tion of what could replace the things that people are so dissatisfied with. We don’t have the models of how we might do things differently.”

It’s a late September afternoon, and Noveck has just finished meet- ing with a half-dozen stu- dents, discussing open government, online re- sources, and crowdsourc- ing. Toward the end of the conversation, she is heard to say, “We’re not sitting on a mountain top, here.” The students lean forward in their chairs when she speaks.

Just three years ago, Noveck was in the Obama White House as Deputy Chief Technology Officer and Director of the Open Government Initiative. She is also the founder of the New York Law School “Do Tank,” the State of Play conferences, and co-founder of a soft- ware company launched to encourage democratic deliberation in the early days of the成败 web.

The American critic Alexander Woollcott once wrote, “I’m tired of hear- ing it said that democracy doesn’t work. Of course it doesn’t work. We are supposed to work it.” From her early days as a student of fragile democracies in 20th- century Europe, Noveck has been devoted to working democracy. So has the GovLab’s other Co-Founder and its Chief of Research and Develop- ment, Stefan Verhulst. Verhulst spent 13 years heading up the research and development division of a private foundation, looking at solving public problems through information technology.

“I became frustrated that most of the problems we know can somehow be solved, but are mostly not solved because we don’t manage to actually engage the public or because the government’s mechanisms are flawed,” says Verhulst. “There is a lot of experimental work going on. It’s about measuring and solving public problems. Unfortun- ately, there’s little evidence as to what works when or for whom or in which context. I thought our biggest contribution would be finding out what works and what doesn’t work through action research.”

Action research means implementing changes or processes while simultaneous- ly reflecting on and evaluating their effec- tiveness. In a fast-moving world, action re- search means solving problems in real time and tailoring the solutions as you go. So when Noveck says “We’re not sitting on a mountain top,” here is how she and Verhulst agree that if you’re going to move a mountain, you can’t be sitting on it.

Working Democracy

Nikki Zeichner used to work as a criminal defense attorney representing narcotics dealers in a federal system that she felt focused more on negotiation than rehabilitation. “I started looking at how I could tell those stories outside a legal context,” she says. “How can you get to know the realities of individuals or communities that aren’t typically heard? How can we bring about change and make policy recognize their voices?” Zeichner, now an MS candidate in Integrated Digital Media and a GovLab Fellow, is working with a coder, a civic hacker, and a data artist to collect public data from parole hearings that will facilitate predictions about rehabilitation versus recidivism. Their parole reform project could have major social and budgetary implications; moreover, it addresses what Zeichner sees as a problem of opacity and invisibility in the penalitry system.

“People think about how prisoners enter the system,” she says, “They don’t think about what happens afterward.”

Suppose we need to work on the following topics:

- Verhulst and Noveck met years ago at a conference.
- GovLab devoted to educational and training offerings.
- A master’s-level curriculum at the NYU
- 13 years heading up the research and development division of a private foundation.
- A platform for education and action on climate change.
- We’re not sitting on a mountain top, here.
- The common thread running through it all can be found in the name: governance.
- What does governance mean—more importantly, what can governments be—in a technologically advancing, information-oriented, and socially networked world? Quite simply, how can technology create a more open and representative government?

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“People think about how prisoners enter the system,” she says, “They don’t think about what happens afterward.”

None of the content [of this work] is proprietary,” Kantrow points out. “It’s all available for use and dissemination.”

This is key to the Gov- Lab’s efforts because, ac- cording to Verhulst, the two biggest assets in soci- ety today are the amount and availability of data and the level of connectiv- ity between people. “We’re focused on open- ing up data, then using it for a variety of public interest projects [and on] reimagining how to tap into the collective intelligence to solve problems differently,” he says.

The GovLab’s third endeavor is to attract and cultivate the in-house technical talent to build tools that enable organizations and citizens to solve problems and participate in their communities and government. To work democracy, as Woollcott put it.

Arnaud Sahuguet, the GovLab’s Chief Technology Officer, came to this position from Google, where for years he pushed for projects around open data and access to civic information. “I’m not yet convinced that we can actually solve all these prob- lems,” he admits, “But at GovLab I can give them my full attention and see what we can do.”

Sahuguet is building software tools while also building a technology team. He’s recruiting product designers and engineers passionate about governance. He says Brooklyn, infused with the spirit of collabora- tion and invention, is the perfect place for this. “At [the NYU Polytechnic School of Engineering], there is a reservoir of tal- ent [and] a rich engineering environment. We’re creating an infrastructure where we can welcome contributions.”

“If you look around, turn on the TV, governance is the number-one issue every- where,” Sahuguet says. “Selling you on the mission is a complete no-brainer. The chal- lenge is to convince people to join a risky adventure.”

In other words, never mind climbing Everest—who wants to help move it? 8
“I take an engineering perspective on proteins. I work on a nanoscale to engineer biological material. The possibilities are endless because we have the ability to modify and make proteins that nature has never thought of making.”

— Jin Montclare, associate professor of chemical and biomolecular engineering

Encouraging Progress Through Diversity

From her own research on nano- and microscale proteins to mentoring the next generation of women in science, Jin Montclare is making a lasting impact.
How to build a protein

Jin Montclare’s lab designs and generates many types of proteins, including one that has been created to detoxify neurotoxins safely.

The protein she builds are first visualized in three dimensions and generated computationally. This graphic illustrates the process.

This ribbon diagram shows a three-dimensional structure of a protein called phosphotriesterase, the protein Montclare is engineering to neutralize organophosphates and pesticides. It’s shown in two colors because it is a dimer with two sub-units. Note that this protein is not visible to the eye or with a conventional microscope as it is nanometer-sized; that’s why these proteins are rendered computationally.

This graphic represents the structure that Montclare originally gave the computational biologist. The computer found what’s known as a steric clash, a molecular detail that means there was a problem in the original structure and it needed a better solution.

This is the improved mutation Montclare ended up with, again through the computer. pFF-F104A is the protein that the computational biologist collaborator designed, based on the original that Montclare had identified.

After that, she was able to build the protein capable of detoxifying neurotoxins with improved stability over the original.

“Pay it Forward

Part of the reason Montclare feels so strongly about encouraging young women in science is because she had “wonderful mentors who shuttled me into science, from elementary school through college and beyond.” A native New Yorker, she earned her undergraduate degree in chemistry and philosophy from Fordham. She has a PhD in inorganic chemistry from Yale and a post-doc from Caltech in chemical engineering.

Montclare’s original role model was her paternal grandmother, who fled with her four children to an orphanage in Busan, Korea, where she managed to find work as a nurse, after her husband was taken captive during the Korean War. She was eventually able to go to Canada to study and then to the U.S., bringing her children over one by one. “[My grandmother] was my role model and an inspiration to my whole family,” Montclare says. “For her, education was truly important—it’s what got her through, how she was able to come to this country.”

Montclare believes the interest and drive toward science must start long before college. To that end, she developed an outreach program on science and technology with the Urban Assembly Institute of Math and Science for Young Women, a girls’ school near the School of Engineering in Downtown Brooklyn, where most of the students come from underprivileged, minority backgrounds. “If I can show other girls [that STEM fields are] exciting, something they can do, and a career worth pursuing, we can increase the numbers in science and engineering,” she says.

“I wish there were more diverse stu-dents, not just females, studying science,” she adds. “You need diverse minds to make progress, to open viewpoints and perspectives in order to attack problems and make discoveries.”

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From the Protein Engineering and Molecular Design Lab at the NYU Polytechnic School of Engineering, Montclare and her team focus on designing and generating protein-derived building blocks that are tailored to serve numerous applications, such as tissue engineering, drug-delivery, imaging, energy and other such domains that require novel biomaterials. In October, she and her colleagues were able to break the nano barrier to engineer a protein that does the work of the original. For as long as scientists have been able to create new proteins that are capable of self-assembling into fibers, their work has taken place on the nanoscale. For the first time, thanks in large part to Montclare, this achievement has been realized on the microscale—a leap of magnitude in size that presents significant new opportunities for using engineered protein fibers.

“This was a surprising and thrilling achievement,” said Montclare, explaining that this kind of diameter increase in the presence of small molecules is unprece-dented. “A microscale fiber that is capable of delivering a small molecule, whether it be a therapeutic compound or other mate-rial, is a major step forward.” Despite the enormity of the jump from nano- to microscale, the research team believes they can devise even larger fibers. The next step, Montclare says, is develop-ing proteins that can assemble on the microscale, creating fibers large enough to see with the naked eye. “It’s even possible to imagine generating hair out of self-assem-bly,” she says. The group published the re-sults of the successful trials in the creation of engineered microfiber proteins in the journal Biomacromolecules.

Montclare hopes that other women will join her at the forefront of sci-ence and technology. She works hard to make sure more girls and women study and consider careers in STEM (sci-ence, technology, engineering, math) fields. One of her latest projects, which involves en-gineering a protein that may prevent brain damage in soldiers and civilians exposed to toxic chemicals, combines the two.

“The project was initiated by a high school student named Michelle Zhang, who wanted to [experience with proteins],” Montclare says. Zhang ended up participat-ing in Intel and other science competitions for high school students and is now a Cor-nell undergraduate. Montclare and her team engineered the protein after becoming interested in how they could break down organophos-phates—compounds commonly used in pesticides and warfare agents, which in-teract with enzymes involved in transmis-sion in the brain and can cause irreversible damage. “We looked at enzymes and con-sidered ones called phosphotriesterases, which can do the job,” she says, but with the drawback that they’re not very stable and don’t last long. Their next step was to reengineer these proteins so they would stand up to heat and time by adding non-natural amino acids. “We introduced new building blocks and used them to fortify these enzymes, stabi-lizing them,” she explains. Using a compu-tational tool called Rosetta, they were able to identify a more stable, longer-lasting protein that does the work of the original. Their research was supported by a grant from the U.S. Army Research Office and the National Science Foundation.

This lab continues to refine this pat-ent-pending process. “Ideally, it will work against lots of toxins not just a specific one,” Montclare says. She expects that a spray that can quickly wash pesticides off produce may be available in less than 10 years.

Montclare ended up with, again this protein is not visible to the eye or with a conventional microscope as it is nanometer-sized; that’s why these proteins are rendered computationally.
The NYU Polytechnic School of Engineering’s Center for K-12 STEM Education is devising new ways to give students a leg up in science, technology, engineering, and math (STEM).

Brooklyn is home to the latest tech boom in the country, a newly located NBA franchise, and, of course, brownstones and cheesecake. Thanks in large part to Ben Esner, a lifelong resident of the borough, K-12 STEM education is on that list too. Esner, the director of the NYU Polytechnic School of Engineering’s Center for K-12 STEM Education, says, “We’re coming up with ideas and formulating new programs that are making an impact right here in Brooklyn and spreading throughout the world.”

Esner can attest first-hand just how far some of the Center’s home-grown ideas have traveled: along with several graduate students from the School of Engineering, he spent part of last year in the Malaysian state of Selangor, where the Science of Smart
Cities (SoSC) curriculum—which employs hands-on exploratory activities in the fields of urban infrastructure, transportation, energy, and wireless communications and teaches middle-school technologies that allow the building of livable, efficient, sustainable and resilient cities—was adopted and modified by the Education Faculty at the National University of Malaysia.

No less exciting, however, is the learning going on in the Brooklyn public schools that take part in another of the Center’s programs: the Applying Mechanisms to Promote Science (AMPS)/Central Brooklyn STEM Initiative (CBSI), which are funded by the National Science Foundation and philanthropic donors, and which pair teachers with graduate student fellows to design dynamic, hands-on classroom lessons in a variety of STEM disciplines.

Russell Holstein, a veteran tech teacher at the Eugenio María De Hostos Intermediate School 318, in Williamsburg, calls having a fellow helping in his classroom and coaching the school’s robotics team a win-win situation for all. “By working with middle-school students, the graduate fellows hone their presentation skills and learn to convey complex information to a lay audience without using jargon,” he says. “And my kids—from the highly motivated members of the robotics team, who take part in the FIRST Lego League competition, to those who purport to not even like science or math—get a lot out of their interactions with the fellows, who are wonderful role models for them.” Holstein’s assertion that his students are benefiting is borne out by hard data: In a three-year study that tracked some 3,000 young participants, 70% of them increased by at least a half of a letter grade (or more) in not only math and science but other subjects as well. (Like Holstein’s fellow, many of the School of Engineering’s other graduate mentors pitch in to help with the FIRST Lego League; the Center for K-12 STEM Education is a strategic partner with New York City FIRST, the organization that runs that and other robotics competitions for students from across the country and whose acronym stands for the phrase “For Inspiration and Recognition of Science and Technology.”) Additionally, NYU has long been the site of the Brooklyn qualifier, which determines which local teams will advance to the citywide competition—AMPS/CBSI is far from the only project at the Center for K-12 STEM Education making a mark on the educational landscape of the city. The Applied Research Innovations in Science and Engineering (ARISE) program, funded by the Pinkerton Foundation, brings dedicated high-schoolers here for a rigorous seven-week program of high-level research in either Dr. Magued Iskander’s Soil Mechanics Lab, Dr. Vikram Kapila’s Mechatronics Lab, Dr. Nasir Memon’s Information Systems & Internet Security Lab, Dr. Jim Montclaire’s Protein Engineering Lab, or any of a host of other well-equipped facilities.

“I got the experience of a lifetime,” one participant wrote at its conclusion. “[During my time here] I was not just a high school student; I was a real researcher, attending symposia, preparing posters and presentations, and working independently in the lab.” Another concurred, writing, “How many people can say they started working in a university lab at age 15? Now that’s impressive.” And in a sentiment that any engineering professor would be thrilled to hear, a third asserted, “I now know that I am made for engineering and research.”

As part of their six-week summer experience, the teachers were treated to a unique workshop conducted by experts from the U.S. Patent and Trademark Office, who discussed intellectual property, patents, copyrights, and trademarks. Putting that information to immediate practical use, the teachers completed patent and trademark searches on their own ideas—just in case someone had already thought of the backpack with an integrated charger for mobile devices. The teachers brought their newly ignited entrepreneurial zeal back to their students, who later competed in another of the Center’s competitions, the district’s FIRST Lego League competition, to hear, a third asserted, “I now know that I was among the first in the entire world to hear about some of this new research.”

During his time at the lab, Chan received an additional honor when he was invited to present the paper—which explores how people’s behaviors and gestures when using computer touchpads might be incorporated into the authentication process—at an international cyber security conference in Portugal in late September. He was the youngest presenter by far. “The most exciting thing was being in the audience at the other presentations and realizing that I was among the first in the entire world to hear about some of this new research,” he said.

Chan will undoubtedly be attending other conferences in the future; he and Halevi explain that while he was not an official part of ARISE in 2014, he returned, by special request, to the lab to continue his research. Another paper is already in progress.
TEACHING THE TEACHERS

NO ONE would argue that it takes a lot to be a teacher—years of training in pedagogy, hours of lesson planning each week, classroom management skills, deep reserves of empathy along with the ability to be firm—the list could go on and on. Now what if you’re charged with getting your students excited about STEM fields and preparing them for the higher-level course work that leads to rewarding careers in the tech sector? Sure, you could bring in a scientist or engineer to give a guest lecture a few times a semester, but what if you wanted to bring that level of excitement and tech expertise to your classroom every day? Simple…just ask the NYU Polytechnic School of Engineering’s faculty and its Center for K-12 STEM Education to help.

Thanks to grants from the National Science Foundation (NSF), the School of Engineering is designated as a Research Experience for Teachers (RET) site and has hosted dozens of teachers who come to Brooklyn over the summer to receive mentoring from professors, engage in entrepreneurship activities, and conduct inquiry-based, hands-on, engineering research as part of a program called SMARTER (Science and Mechanotronics Aided Research for Teachers with an Entrepreneurship Experience). SMARTER participants return to their classrooms in the fall with new project ideas and practical experience in using sensors, actuators, microcontrollers and other sophisticated equipment, and their students directly benefit. How many high school kids get a chance to fully equip a model home with an Arduino, Wi-Fi, lights, and a servo door opener and then develop an iPhone App to control those functions? Jeffrey Bernhardt did during an eight-week curriculum he created after participating in SMARTER. How many can test underwater robotic vehicles in a 125-gallon tank installed right in their classrooms or investigate the material properties of soft tissue by using digital force probes and Jell-O? Other teachers have brought those creative learning opportunities to their schools after their own SMARTER sessions.

In 2014 the NSF awarded a team of professors—Nasir Memon, Justin Cappos, Vikram Kapila, and Ramesh Karri—$500,000 to develop a Research Experience for Teachers Site focused on the burgeoning field of cyber security. (Not incidentally, the new program lays the groundwork for teachers to involve their students in the School of Engineering’s annual Cyber Security Awareness Work forensics competition.) Whether they’re studying mechatronics, cyber security, or some other topic here, teachers have the satisfaction of knowing that they’re an important part of a push to provide America’s classrooms with exceptional STEM teachers. Easier has no doubt that with the help of programs like those at the School of Engineering that goal can be realized. “K-12 STEM education has been a continually growing part of the culture here for over a decade,” he says. “And during that time, literally thousands of students and their teachers have been impacted by this work through dozens of programs. Professor Vikram Kapila, with 18 years of experience in our Mechanical and Aerospace Engineering Department, is a driving force behind making K-12 STEM a priority, and he expects it to remain so for decades to come.”

TAKING A NEW PATH

RYAN CAIN no longer teaches at Brooklyn’s P.S. 3 The Bedford Village School. He left behind his after-school robotics club, the 3-D printers he had worked so hard to obtain for his classroom, and the sand table where he taught the impact of flood events on our built environment by using model building structures created by students using 3D printers. “It was a hard departure,” he says. “My principal and co-workers were not happy I was going, and of course I felt some guilt for leaving the students.”

Perhaps your first thought is that Ryan heartlessly abandoned the Bedford Village community to pursue more lucrative career as a bond trader. Perhaps you assume he is following some impractical or selfish dream (say, sailing solo around the world, for example). If so, think again. Ryan does, indeed, have a dream, but it is both practical and selfless. He is now a doctoral student at Utah State University, where he won a competitive fellowship in Instructional Technology and Learning Sciences. He was inspired to apply, he explains, because of the time he had spent in various programs run by the Center for K-12 STEM Education. (A veteran participant, Ryan had completed a mechatronics-based Research Experience for Teachers, hosted at AMPs/CBIS fellows in his classroom, and coached an after-school robotics team.) “It was great taking everything I learned and applying it to the lessons I taught my own students in my own classroom, but I wanted to have an even bigger impact,” he explains. “All students in all classrooms should be excited about STEM learning. And they all deserve a solid foundation that will prepare them for the future.”

Ryan reasoned that one of the most effective ways he could work towards that goal would be to teach teachers, just as the professors at the NYU School of Engineering were doing with their efforts. “I realized I wanted to achieve what they were achieving,” he says. “They were affecting much more than just one classroom at a time.”

ANY YOUNGER interested in science, technology, engineering, and math has the wholehearted support of Department of Education Chancellor Carmen Farina, as she explained to the audience at the July launch of the NYU Polytechnic School of Engineering’s 2014 #STEMNOW initiative, which involved fully a quarter of the School of Engineering’s full-time faculty, 50 NYU student fellows, 50 K-12 and college faculty, and nearly 500 middle and high school students. “There’s a shortage in this country of people to do the science, the engineering, and the technology work,” she asserted. “You are the answer to that… You are the answer to all of our problems.” #STEMNOW was comprised of well over a dozen individual programs, including:

- Applied Research Innovations in Science and Engineering (ARISE)
- Applying Mechatronics to Promote Science (AMPS) and Central Brooklyn STEM Initiative (CBIS)
- Code Liberation Foundation series on women in digital game development
- College-credit courses for high schoolers
- CRiST Mobile
- Cyber Security for Teachers and College Faculty
- Cyber Security for Young Women
- Research Experience for Teachers—SMARTER
- Science of Smart Cities
- Summer Research Opportunities for High School Students
- Tech Kids Unlimited

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I’VE BEEN TEACHING technology at Fort Greene Preparatory Academy since the school opened more than four years ago, and I’ve been working with the NYU Polytechnic School of Engineering’s Center for K-12 STEM Education for almost that long. As part of the AMPs/CBIS program, I had a terrific graduate fellow in my classroom for two years, James Muldoon, an electrical engineer, and this year my fellow is Matthew Moorhead, a mechanical engineer. It’s a good situation for everyone involved. The fellows bring great expertise in their specific fields, and as I learn from them, my curriculum grows. In addition to robotics, we now program with Python, design computer games, work with Arduinos, and much more. In turn, the fellows learn from my pedagogical approach; they develop the ability to explain their work to laypeople and get comfortable addressing a class.

Most important, they really get the kids excited about the practical applications of STEM and the career possibilities. My students might never have met an engineer before, so the fellows are living answers to that common question, “Why do we have to study this stuff?” Fort Greene Preparatory Academy was founded on the belief that children should have access to a well-rounded education, and what I teach is an important part of that. It really opens the kids’ eyes when they start out the year thinking they know all about technology simply because they can operate their smartphones and then they realize how much there is to learn!

SARANI MULLER IN HER OWN WORDS

Fort Greene Preparatory Academy celebrated with her students at the 2014 FIRST Lego League Brooklyn Qualifier.
IN MEMORIAM: CLIFFORD H. GOLDSMITH (HON ’06)

The NYU Polytechnic School of Engineering mourns the passing on June 25, 2014 of much-admired former trustee and board vice chair, Clifford H. Goldsmith (HON ’06).

In 1986, Clifford was appointed to the Board of Trustees of Polytechnic University, now the NYU Polytechnic School of Engineering, and served as Vice Chairman. Early in his 19-year tenure on the board, Clifford co-founded the Promise Scholarship Fund which provides scholarships to exceptional students with financial need. Thanks to his vision, the Promise Scholarship Fund, thrives today, enhancing our ability to provide critical resources to diverse students seeking a high-quality STEM education. In recognition of his contributions, he was presented with the Polytechnic Distinguished Service Award for Science and Technology in 1998. In 2006, Clifford’s legacy of achievements was further acknowledged with an honorary degree.

Born on September 6, 1919 in Leipzig, Germany, Clifford graduated from Bradford University, York- shire, England, with a degree in textile engineering and later emigrated to the United States in 1940. He served in the United States Army during World War II and was held as a prisoner of war in Germany. In 1945, he joined the Benson & Hedges Company, ultimately becoming President of Philip Morris Incorporated from 1978 until 1984. As President of Philip Morris, he served in the United States Army during World War II and was held as a prisoner of war in Germany. In 1945, he joined the Benson & Hedges Company, ultimately becoming President of Philip Morris Incorporated from 1978 until 1984.

The NYU Polytechnic School of Engineering community has lost an exceptional leader and humanitarian. His dedication to advancing our mission will long be remembered. We extend our condolences to his wife, Katherine; his two daughters; and the entire Goldsmith family.

WILLIAM ORTH (’52)

We sadly report the death of William Orth (’52) on September 22, 2013, at the age of 94 in Pearland, Texas.

As a young husband and father, Orth worked full time and attended what was then known as the Brooklyn Polytechnic Institute in the evenings, in order to earn his bachelor’s degree in mechanical engineering. Until the end of his life, he displayed bookends inscribed with the school name, and the set proved to be a conversation starter for visitors to his home.

The loyalty and responsibility Orth felt towards his family was echoed in his work life; he remained at the Ford Instrument Company, a division of Sperry Gyroscope, for more than three decades. A member of the American Defense Preparedness Association, Orth worked on such projects as modernizing an electro-mechanical analog control computer used by both the U.S. Navy and the British Navy and upgrading the MK 10 Range Keeper—part of the Gun Director System used on warships like the U.S.S. Texas.

Orth later joined Lundy Electronic and Systems as a staff engineer, and there he worked on components for the Minuteman III Missile.

In addition to square dancing—a pursuit he avidly enjoyed—Orth’s other hobbies included riding roller coasters, and he was a devoted Gold Pass member of Busch Gardens until well into his 80s. Our deep condolences go to his wife, Betty, his son, William; his daughter, Louise; his grandchildren, Ashley-Anne, Derek, Drew, Christo-
It is with great sadness that we report the passing on October 21 of Leonard Shaw, who taught at the NYU Polytechnic School of Engineering for more than four decades.

In addition to his teaching duties, Shaw served as Head of the Department of Electrical Engineering for three decades, a position that he held from 1977 to 1990. During his tenure, the department grew from 13 faculty members to more than 35, and the number of students increased from approximately 300 to more than 1,000. Shaw was also a key figure in the development of the Institute of Electrical and Electronics Engineers (IEEE), where he was a charter member and served as President in 1993. He was also a member of the National Academy of Engineering and the American Academy of Arts and Sciences.

Shaw’s research in the areas of signal processing, estimation, and detection was widely recognized, and he published numerous papers in these fields. He was a frequent invited speaker at conferences and workshops, and his work was cited by many researchers in the field.

Shaw was a devoted advisor and mentor to his students, many of whom went on to make their own mark in the field. He was known for his engaging personality and his ability to inspire his students to achieve their full potential.

Shaw was a leader in the development of the IEEE Signal Processing Society, and he served as its President in 1984. He was also a member of the IEEE45th Anniversary Committee, which was responsible for organizing the IEEE celebration of its 45th anniversary.

Shaw was a member of the New York Academy of Sciences and served as its President from 1986 to 1988. He was also a member of the National Academy of Sciences and the American Academy of Arts and Sciences.

Shaw was a lifelong member of the New York City Police Department and served as a Civil Engineer with the Department of Environmental Protection. He was also a member of the New York City Fire Department.

Shaw was deeply committed to his family and friends, and he was known for his generosity and his willingness to help others.

Shaw was a devoted father and grandfather, and he leaves behind his wife, his daughter, and his grandchildren.

It is with deep regret that we announce the passing of dedicated

2014

August 24, 2014

Dr. Howard Brenner

The NYU Polytechnic School of Engineering, along with the entire NYU community, mourns the passing of Dr. Howard Brenner, an eminent alum and former faculty member. Brenner, widely considered one of the foremost leaders in the transport properties of flowing suspensions and multiphase systems, earned both his master’s and doctoral degrees in chemical engineering from NYU, in 1954 and 1957, respectively. He then taught in the Department of Chemical Engineering at MIT, where he remained true to its broad spirit and underlying mission. We miss his engaging participation in Poly’s future while remaining true to its broad spirit of scholarship and commitment.

Continuing the tradition of philanthropy he established during his life, his family asks that donations be made in his memory in the Bender Fishbain Endowed Scholarship at NYU Polytechnic School of Engineering, atm: Judy Sager, Office of Development and Alumni Relations, 15 MetroTech Center, 6th Fl, Brooklyn, NY 11201.

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Shaw was a devoted father and grandfather, and he leaves behind his wife, his daughter, and his grandchildren.
“I came to the NYU School of Engineering as a graduate student, when it was known as the Polytechnic Institute of Brooklyn, and stayed on for the next 47 years to teach and do research. As a professor, I’ve always felt great empathy and admiration for our students. Many have been the first in their families to attend college, and many have come from other countries to better their lives. They’re an extremely motivated group, willing to work hard, and I want to do everything I can to help them reach their goals. Because of my investment of time and energy here, the success of our students and the recognition of Poly are very important to me. That’s why I choose to fund scholarships; it’s a way to have a meaningful impact on the lives of our students, and through them the stature of Poly.”

Henry Bertoni ‘62, ’67 earned his M.S. in Electrical Engineering in 1962 and his Ph.D. in Electrophysics in 1967. Over the course of his career, he twice served as head of the Electrical and Computer Engineering Department, was vice provost of graduate studies, and directed the school’s Wireless Internet Center for Advance Technology (WICAT). A longtime fellow of the IEEE and the author of the text *Radio Propagation for Modern Wireless Systems*, he has done seminal research on wave phenomena in electromagnetics, ultrasonics and optics.

For more information on how you can help the NYU Polytechnic School of Engineering, contact Judy Sager at jsager@nyu.edu or call 1-718-260-3298.
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