DIVISION OF MATH AND NATURAL SCIENCES

Discover Science

AT QUEENS COLLEGE
CITY UNIVERSITY OF NEW YORK

Biology

The genomic and computational revolutions have catapulted biology to the next big frontier in science. Our 16 full-time professors are top researchers in several areas, with particular strengths in evolutionary biology and developmental biology. Several laboratories led by faculty members provide valuable opportunities for our students to work on cutting-edge and high-profile research projects.

THE EXPERIMENTAL EVOLUTION LAB of John Dennehy investigates development, life history, population dynamics and evolution using the controlled experimental evolution of bacteriophages. This lab also uses bacteriophages as biological models for pathogenic viruses, with particular interest in exploring the process of virus emergence and developing antiviral and antibacterial therapeutics.

THE BEHAVIORAL EVOLUTION LAB of David Lahti is devoted to understanding the ecology, development, function, and evolutionary history of complex features using a combination of field, laboratory, and theoretical approaches.

THE MOLECULAR EVOLUTION LAB of Stephane Boissinot focuses on the evolution of mammalian genetic transposable elements, mostly in rodents and primates, and how transposable element activity has affected the structure and function of mammalian genomes.

THE CELL REGULATION LAB of Alicia Melendez looks at the molecular mechanisms that affect the cellular process of autophagy, and how autophagy is regulated in multicellular organisms. Autophagy is the major cellular pathway for degrading long-lived proteins and cytoplasmic organelles.

UNDERSTANDING HOW BEHAVIOR EVOLVES The Biology Department's Behavioral Evolution laboratory is devoted to understanding the ecology, development, function, and evolutionary history of complex features. Birds and humans, for instance, are not born knowing how to communicate, but must learn to make specific sounds that convey information to other individuals. With a combination of field, laboratory, and theoretical approaches, **David Lahti** and his students investigate why learned vocal sounds came to be the way they are, and how they change across generations.

Organisms continually adapt to changing environments, including persistent natural enemies that are themselves evolving. This adaptation can be remarkably quick, and an organism can employ diverse and surprising strategies. Many birds, for instance, face challenging obstacles to reproduction in the form of "brood parasites"—other birds that would kill their eggs and put strange ones in their place. By studying situations like this in a number of species, the Lahti Lab explores how evolution by natural selection works.

FACULTY ACCOMPLISHMENTS

One of several members of the Biology Department to have won prestigious grants from the National Science Foundation (NSF) or National Institutes of Health (NIH), **John Dennehy** received an NSF CAREER award, an especially important honor for junior faculty, with $700,000 to support the research of his Experimental Evolution Lab.

STUDENT ACCOMPLISHMENTS

CUNY graduate students based at the Queens College Biology Department won highly competitive NSF grants and fellowships. In 2011, doctoral student **Elliot Aguilar** of the Behavioral Evolution Lab was awarded an NSF pre-doctoral fellowship for developing mathematical models of cultural evolution. Queens College undergraduates are also fully involved in research; many publish first-author publications and receive major awards. Queens College biology undergraduates have continued their studies at top-ranked graduate and medical schools including Harvard University, Albert Einstein College of Medicine, and University of Rochester. Several biology undergraduates have received Jonas E. Salk Scholarships, one of the most prestigious scholarships bestowed on CUNY undergraduates. Many of our students are active in overseas summer research programs, such as **Kevin Mu,** who participated in the Overseas Honors Program in Evolution, Ecology and Conservation in Ecuador and the Galapagos.

UNDERGRADUATE DEGREES

BA in Biology

BA in Biology-Education

BA in Psychology-Neuroscience

UNDERGRADUATE MINORS

Biology

GRADUATE DEGREES

MA in Biology

PhD in Ecology, Evolution and Behavior

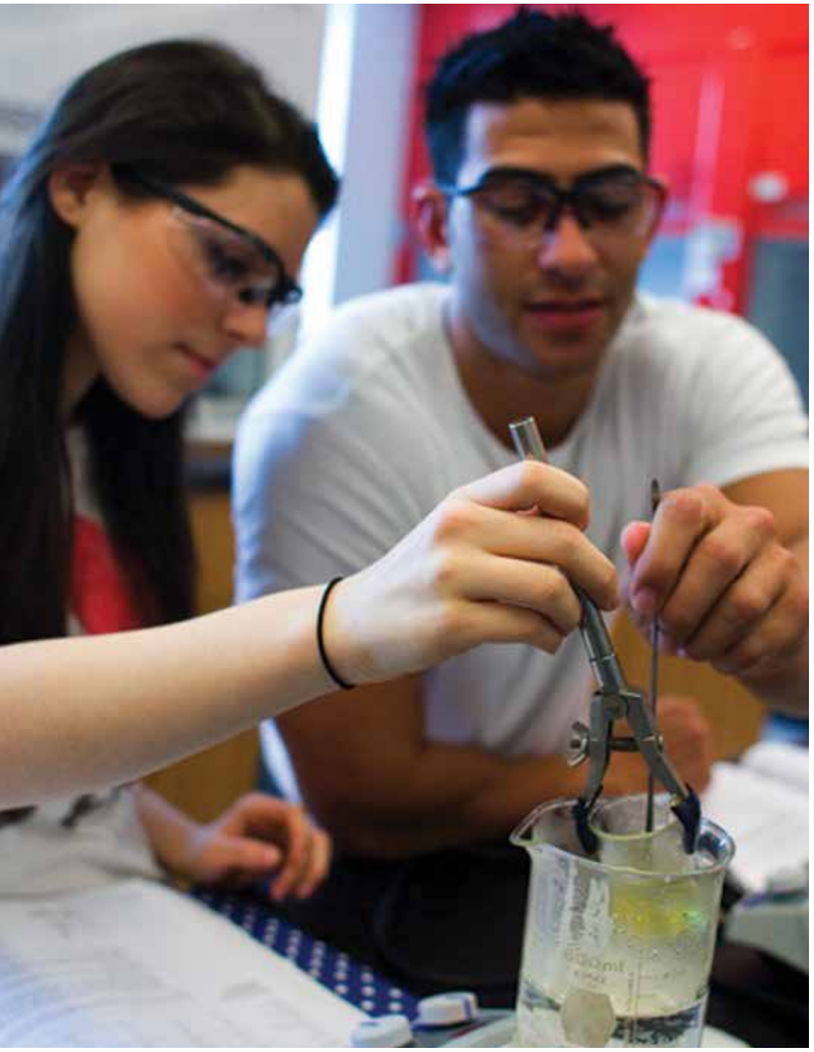
PhD in Molecular, Cellular and Developmental Biology

PhD in Neuroscience

PhD in Plant Sciences

Chemistry and Biochemistry

Our 17 full-time faculty members teach and carry out research in physical chemistry, nanotechnology and material science, organic chemistry, analytical chemistry, inorganic chemistry, and biochemistry. Among our current projects:



DR. MIRKIN'S LAB inserts extremely small electrodes into microscopic spaces to investigate chemical and biological structures and processes.

DR. ENGEL'S LAB [photo on opposite page] designs and synthesizes a variety of organic salts that serve as pharmaceutical treatments for bacterial/fungal infections, anti-tumor agents, and the treatment of diseases such as muscular dystrophy.

DR. SAFFRAN'S LAB studies how cells defend themselves against mutations and DNA rearrangements produced by carcinogens.

DR. BITTMAN'S LAB synthesizes lipids with novel, unnatural structural features that permit them to be effective against disease processes in which natural lipids play a key role.

DR. GAFNEY'S LAB focuses on solar energy conversion that maximizes energy output and minimizes greenhouse gas evolution by using low-cost materials and sunlight to convert carbon dioxide to natural gas (artificial photosynthesis).

DR. ROTENBERG'S LAB explores enzyme-driven mechanisms of breast cancer metastasis.

DR. CHEN'S LAB develops new methods for synthesizing biologically interesting and pharmaceutically important molecules—using late-transition metals, especially gold and palladium, as catalysts.

DR. KUMAR'S LAB develops specific inhibitory agents of an enzyme implicated in breast cancer, as well as chemical modulating agents of protein tyrosine phosphatases, which are essential for many cell functions.

FACULTY ACCOMPLISHMENTS

CUNY Distinguished **Professor Robert Bittman** received the Avanti Award from the American Society for Biochemistry and Molecular Biology for outstanding contributions in the area of lipid research.

Prof. Seogjoo Jang recently received a Camille Dreyfus Teacher-Scholar Award and an NSF CAREER Award, which provides funding for his research on developing computer models that track how energy in light is handed off from one molecule to another. His theoretical work will help unravel the mystery of photosynthesis, in which light from the sun supplies the original source of energy for all life on Earth.

Prof. Jianbo Liu is also a recipient of an NSF CAREER Award; he studies how chemical reactions with oxygen change the function of important molecules in living things. His lab uses instrumental analysis (mass spectrometry, spectroscopy, and ion-molecule reactions) to probe biologically relevant biomolecules and processes.

STUDENT ACCOMPLISHMENTS

Students who are highly successful in their coursework are invited to join the Beta Delta Chi Chemistry Honor Society. Members serve as departmental tutors and plan events of interest to science majors. Each year, the faculty salutes the achievements of these top chemistry students by hosting a reception in their honor.

For the past two years, QC chemistry students outperformed 15 to 20 teams to win the gold medal in the annual Long Island-ACS competition.

ALUMNI ACCOMPLISHMENTS

A degree in chemistry or biochemistry provides problem-solving training that is essential for many lines of work. Our alumni have gone on to exciting careers in a variety of fields.

Dennis Liotta (QC '70, CUNY PhD '74), a chemistry professor at Emory University, developed the major AIDS treatment pharmaceutical in current use. Liotta recently received an honorary doctorate from QC.

Stephen Fischkoff (QC '72) is a prominent oncologist in the pharmaceutical industry.

Garo Armen (QC '75, CUNY PhD '79) is chairman and chief executive officer of Agenus, Inc., a biotechnology company he co-founded in 1994.

JaimeLee Rizzo (QC '98, CUNY PhD '01), a Pace University chemistry professor who co-invented new technology for antimicrobial surfaces, is currently chair of the New York Section of the ACS.

Jose Zambrana (CUNY PhD '07) works for the U.S. Department of Environmental Protection in Washington, D.C.

Miriam Ginzberg (QC '08) is pursuing a PhD in chemical biology at Harvard University.

UNDERGRADUATE DEGREES

BA in Chemistry

BA in Biochemistry

Both majors are certified by the American Chemical Society (ACS)

UNDERGRADUATE MINORS

Chemistry

GRADUATE DEGREES

MA in Chemistry

MA in Biochemistry

MA in Chemical Education

PhD in Biochemistry

PhD in Chemistry

Esther Frederick (QC '11) is pursuing a PhD in chemistry at Princeton.

Hugo Jhun (QC '11) is pursuing a PhD in molecular microbiology and immunology at Johns Hopkins University.

For decades, **Prof. Harry Gafney** and his staff have produced the Hayden Lecture Demo Show for students at neighboring high schools. This widely acclaimed presentation delights teenage audiences while introducing them to the magic of chemistry.

Computer Science

Computer science is essential to our interconnected, Internet-enabled, high-tech world. Our professors are prominent researchers in several areas of computer science, with particular strengths in natural language processing, databases and visualization, and networks and security. In addition, our faculty lead several research laboratories, which allow our students to get hands-on experience with the latest technologies.

THE LINGUISTIC AND ASSISTIVE TECHNOLOGIES LAB conducts research in computational linguistics and human-computer interaction, with a primary focus on accessibility applications and assistive technology for people with disabilities.

THE INFORMATION EXTRACTION AND FUSION LAB explores automatic techniques for building databases from texts across languages, documents, and media.

THE SPEECH LAB investigates new approaches to the automatic recognition of human speech, including how computers can detect and use our intonation and prosody.

THE UNCERTAINTY REASONING LABORATORY focuses on developing methods and tools for reasoning and decision making under uncertainty. **Changhe Yuan** [opposite page, on the right] and his students apply these models to multidisciplinary areas.

THE LABORATORY FOR BIOMETRICS APPLICATIONS TO ROBOTICS AND SECURITY (BARS) fosters education, research interest, and collaboration in investigating direct and inverse biometrics solutions to enable secure human-robot interaction with non-repudiation. Application areas include privacy-preserving information exchange and emergency rescue missions.

UNDERGRADUATE DEGREES

BA in Computer Science

BS in Computer Science

UNDERGRADUATE MINORS

Computer Science

Computer Information Technology

Computational Linguistics

Financial Modeling

GRADUATE DEGREES

MA in Computer Science

PhD in Computer Science

FACULTY ACCOMPLISHMENTS

Several Computer Science faculty members have won NSF CAREER Awards, including **Changhe Yuan,** whose grants support his research on methods and tools for reasoning and decision making under uncertainty, and **Matt Huenerfauth** [opposite page, wearing gloves], who leads the Linguistic and Assistive Technologies laboratory. Huenerfauth's lab uses motion-capture equipment (gloves with sensors, special body suits, and eye-tracker helmets) to digitize the movements of humans performing American Sign Language (ASL). By analyzing patterns in how humans execute ASL signs in different sentences, his team can design animated characters that perform realistic and understandable ASL sentences. Among deaf high school graduates in the United States, a majority read English at a fourth-grade level or below; software for generating ASL animations can make more information sources accessible to these individuals. The research team includes CUNY doctoral, master's, and undergraduate students—as well as deaf students from local high schools, who participate in a summer research internship program.

Andrew Rosenberg conducted research at the IBM Thomas J. Watson Research Center as part of the speech synthesis team for the IBM Watson computer that made a media splash in 2011 by defeating two human contestants on the TV quiz show, "Jeopardy!" Rosenberg's focus was on improving the naturalness of Watson's voice. His laboratory focuses on how the prosody in human voice—pitch, loudness, and speed—conveys important, meaningful information that can be harnessed by speech-recognition software. Prosody-sensitive speech technologies have applications in automatic detection of deception or in providing feedback to learners of English as a second language.

A WINNING TEAM

The Queens College computer programming team, under the advisement of Jerry Waxman, has competed in the ACM International Collegiate Programming Contest for several years. In a Greater New York regional competition, Queens College's squad defeated teams from New York University, Rutgers University, and several other institutions. Hosted by the Association for Computing Machinery, the competition prepares students for the challenges they will encounter as professional programmers, and is an excellent opportunity for students to interact with industry representatives.

ALUMNI ACCOMPLISHMENTS

Some of our computer science graduates have continued their studies at top-ranked graduate schools (such as Carnegie Mellon University and Yale University); others have begun careers at Fortune 500 companies, such as Amazon and CA Technologies, a company founded by Queens College alumnus **Russell Artzt** (BA '68). Many of our students complete internships during their undergraduate years. A case in point is **Ayman Zeidan** (BA '01, MA '06), who interned at CA Technologies and is now a faculty member at Jordan University of Science and Technology. Ayman was also a member of the project team that won first place in a nationwide student competition organized by Oracle in 2001. In addition to Artzt, the list of alumni entrepreneurs includes **Rony Zarom** (MA '94), who founded and sold a company called eXalink, and is currently the CEO of Decima Venture.

Earth and Environmental Sciences

Using a multidisciplinary approach, the School of Earth & Environmental Sciences (SEES) examines Earth processes within and especially on the surface of our planet. Researchers study the materials involved and created by those processes, and they investigate past, present, and potential future changes, with a focus on human impacts. The interdisciplinary nature of this study is emphasized by our undergraduate and graduate courses, and reinforced by faculty research. Marine biologists, ecologists, meteorologists, and soil scientists share with geologists, geochemists, and hydrologists the excitement of the study of our Earth.

PREPARING STUDENTS FOR THE FUTURE

The major tracks in the School of Earth and Environmental Sciences prepare students for

- graduate and professional work in geology and environmental sciences;
- careers in environmentally related industries;
- teaching secondary school earth science, geology, or general science.

Our courses also provide a foundation in environmental sciences and environmental studies to students in other natural and social science disciplines.

DRILLING IN ANTARCTICA

In 2010, **Stephen Pekar** [opposite page, talking to group of students] traveled with an international team of scientists to Antarctica as part of the NSF-funded Integrated Ocean Drilling Program. The team drilled more than half a mile below the sea floor to extract sediment and other materials that can be examined in order to look back in time at the Earth's climate. These sediments will allow researchers to understand changes that occurred 30 to 45 million years ago—when the atmosphere had large concentrations of carbon dioxide. The goal of this project is to understand how today's climate may be affected by changes in the carbon present in the atmosphere.

EXPLORING THE GULF OF ALASKA

Over the past several years, **Gillian Stewart** [opposite page, netting samples] and her students took part in an NSF-funded project in the Gulf of Alaska. Cruising from the coast of Vancouver Island into the North Pacific Basin—one of the few places in the world where annual average ocean surface temperature is decreasing and not increasing—they collected plankton and water samples. Then, using polonium-210 as a tracer, Stewart determined how much carbon had been absorbed and exported by small phytoplankton and zooplankton. Understanding how carbon is absorbed in the ocean helps us model and predict global warming.

DIAGNOSING AN EARTHQUAKE IN HAITI

The earthquake that struck Haiti in 2010 was catastrophic, causing about 230,000 casualties and devastating the capital and surroundings. Visiting the country later that year, a team of geologists and geophysicists led by **Cecilia McHugh** [opposite page, working with a student] took core samples from the sea floor. The cores contain a 2000-year-old sequence of sediment layers that closely resemble the massive landslide deposits triggered by the recent quake, indicating an older event of similar characteristics and violence. Understanding the behavior and timing of major earthquakes is crucial for protecting people and infrastructure around active fault zones. Like the San Andreas Fault in California, the Enriquillo-Plantain-Garden Fault Zone, where the Haiti earthquake occurred, is a "strike slip" fault, in which the two plates typically slide past one another horizontally. But it appears that in 2010, the plates were also thrusting toward one another. The Tapion Ridge is thought to be a consequence of many such earthquakes.

UNDERGRADUATE DEGREES

BA in Environmental Studies

BA/BS in Environmental Sciences

BA/BS in Geology

UNDERGRADUATE MINORS

Environmental Science

Environmental Studies

Geology

GRADUATE DEGREES

MA in Geological and Environmental Sciences

MS in Applied Environmental Geosciences

MA in Biochemistry

MA in Chemical Education

PhD in Earth and Environmental Sciences

CERTIFICATION PROGRAMS

Advanced Graduate Certificate in Earth Science Teaching

GLOBE Program Certificate

Family, Nutrition and Exercise Sciences

The Department of Family, Nutrition & Exercise Sciences (FNES) brings together people who study family and consumer sciences, textiles and apparel, food service management, nutrition and dietetics, physical education, and exercise science. This includes, but is not limited to, individuals preparing to become teachers of family and consumer sciences and physical education.

FNES (pronounced as "finesse") is dedicated to a complex and demanding mission: to provide quality educational experiences and conduct groundbreaking research to enhance the health and well-being of individuals, families, and communities in an increasingly global society. The department is housed in two buildings, Remsen Hall (family and consumer sciences, textiles and apparel, food service management, nutrition and dietetics) and FitzGerald Gymnasium (exercise science and physical education).

FALL FLAVORS OF TUSCANY

Clare Consiglio's Meal Planning and Management Class, working in conjunction with Andrea Trapani, executive chef of the Apicius International School of Hospitality in Florence, Italy, prepared traditional and light versions of Eggplant Parmigiana, Stuffed Mushrooms, and Chocolate Mousse with Raspberry Sauce. Students learned about Italian cuisine, food labeling, and the Italian Riviera.

STUDYING HOW HUMANS MOVE

Researchers at the Biomechanics Laboratory use motion-capture equipment (gloves with sensors, special bodysuits) to digitize the movements of adults and children performing sports movements, as well as activities of daily living.

DESIGNING AN OPTIMUM WORKOUT

Michael Toner [this page, wearing tie], studies how workouts function, using state-of-the-art technology at the Exercise Physiology Laboratory, located in FitzGerald Gymnasium. The equipment is capable of a variety of measurements, such as cardiovascular health and fitness, body composition, pulmonary function, muscular strength, biomechanical analysis, muscular strength and endurance, and resting metabolic rate.

UNDERGRADUATE DEGREES

BA in Family and Consumer Sciences, with concentrations in:
- Dietetics
- Family & Consumer Studies
- Food Service Management
- Teacher Education K–12
- Textiles and Apparel

BS in Nutrition and Exercise Sciences

BS in Physical Education

GRADUATE DEGREES

MS in Nutrition and Exercise Sciences, with specializations in:
- Nutrition
- Exercise Science
- Nutrition and Exercise Sciences

MS in Family and Consumer Sciences Teacher Education

MS in Physical Education Teacher Education

POST-BACCALAUREATE INITIAL CERTIFICATE AND PROFESSIONAL CERTIFICATE PROGRAMS

Family Consumer Sciences

Education K–12

Physical Education K–12

NUTRITION AND SUSTAINABILITY

FNES's Vegetable and Herb Garden, started at QC in 2007, is a model of a sustainable food system. Students help to expand the garden each semester, planting and nurturing the produce, which is used in the Food Laboratory. Scraps are collected and brought to the compost bin.

STUDYING INTERNATIONAL FAMILY POLICIES

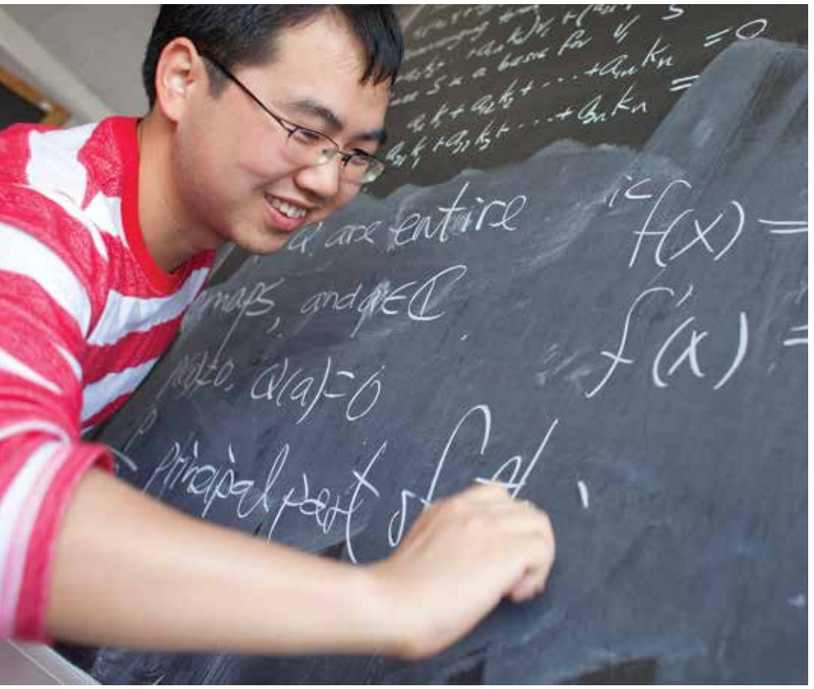
Mihaela Robila is the coordinator and program advisor for the Family and Consumer Studies program. She conducts research and teaches on the topics of family policy, cultural diversity, family relations and child development. Besides publishing in peer-reviewed journals, she has written a book on Eastern European immigrant families and edited another on families in Eastern Europe. Robila has also served as an expert on family policies for the United Nations. Her work has been funded by Spencer Foundation, Fulbright, American Councils for International Education/U.S. Department of State, United Nations, and Fahs Beck Fund, among others.

PHYSICAL THERAPY FOR CHILDREN WITH DISABILITIES

Ya Ching Hung conducts research on biomechanics, motor learning, and motor control; she is especially interested in movement control and development in children with and without physical disabilities. Before and after children with hemiplegic cerebral palsy received intensive treatments, her laboratory used a 3-D kinematic system to evaluate their hand function, gait control, and postural control and compare their performance to that of typically developing children. Recently, she has investigated movement control issues in obese and overweight children.

Mathematics

Queens College students experience a wide range of mathematics. This exciting field prepares individuals for careers as mathematicians, teachers, professors, actuaries, statisticians, or analysts, as well as many positions in business and finance, engineering, software development and computer science, and economics. Our students may also find work in scientific, government, and industrial sectors.



Members of our faculty conduct research in a variety of areas that help us to better comprehend our world. Applications include analyzing complex or chaotic systems, processing and securing information, computing and understanding the structure of solutions to difficult problems, and providing a mathematical framework to grasp the small and large-scale interactions in our universe.

- Algebraic number theory studies properties of integers, such as factorization, and symmetries of solutions to polynomial equations with integer coefficients, with applications in secure communications. **Steven Kahan** [opposite page, top left] discusses number theory with students.
- Analysis concerns real and complex valued functions, with applications to differential equations, quantum mechanics, and the study of complex structures.
- Computability and complexity theory involves understanding what things can be computed, and how efficiently it can be done. This field enjoys close interaction with computer science, via the study of algorithms and their implementation, as well as algebra and symbolic computation.
- Combinatorics develops methods to solve complicated mathematical questions by organizing and counting discrete structures.
- Dynamical systems is the study of a time-dependent system, evolving under some given rules. Examples include the swinging of a clock pendulum, the flow of water in a pipe, or the orbit of planets.
- Geometry and topology centers around the study of manifolds, a mathematical abstraction of space-time, as well as more general "spaces." Applications include the study of gravitation and black holes, the standard model in physics, as well as the quantum and topological field theories playing a central role in 21st-century mathematics.

REAL PROBLEM-SOLVERS

Each year, Queens College undergraduates participate in the Mathematical Contest in Modeling, an international competition sponsored by the Consortium for Mathematics and Its Applications. During the intense, four-day event, teams of three students work together to analyze a real-world situation mathematically, and produce a solution. The Queens College Mathematics Department is also active in preparing and supporting students to compete in the William Lowell Putnam Examination, administered annually by the Mathematical Association of America. This is a nationwide contest involving fun and rather challenging problems.

UNDERGRADUATE DEGREES

BA in Mathematics, with concentrations in:
- Pure Mathematics
- Applied Mathematics
- Secondary Education
- Elementary Education

UNDERGRADUATE MINORS

Mathematics

GRADUATE DEGREES

MA in Mathematics

MA with concentration in Applied Mathematics

MS in Mathematics Education

PhD in Mathematics

A NEW YORK CITY HUB OF NUMBER THEORY RESEARCH

Our professors help make the New York metropolitan area a world center for number theory, one of the oldest and most fundamental branches of mathematics. **Kenneth Kramer** is the co-principal investigator for the NSF Research Training Group in number theory, comprising members from Columbia, CUNY, and New York University. This group sponsors much local activity, including student training, research seminars, and public outreach. **Krzysztof Klosin** and **Maria Sabitova** round out a strong team, making Queens College a hotbed for work in this field.

Basic research in number theory has led to important applications in computer science and solutions to systems of algebraic equations, as well as applications to cryptography. Recent spectacular breakthroughs in the subject, such as the Taylor-Wiles resolution of the 300-year-old problem known as Fermat's Last Theorem, use and develop an enormous amount of mathematics, much of it outside number theory. These tools and advances suggest a promising future for research in this area, with many interesting problems for students and future mathematicians.

FACULTY ACCOMPLISHMENTS

Alexey Ovchinnikov is currently funded by the National Science Foundation's CAREER Award, their most prestigious grant for junior faculty. This award supports his research in differential algebra.

STUDENT ACCOMPLISHMENTS

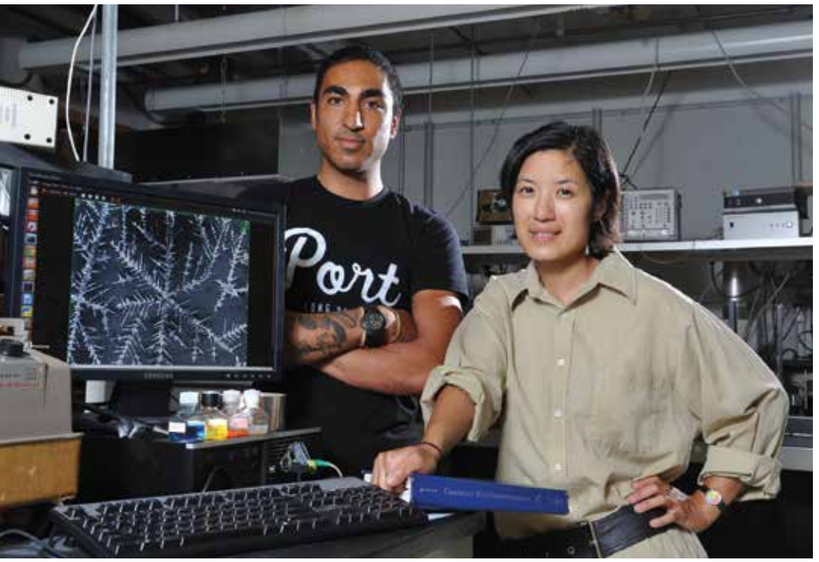
Mathematics students at Queens College have a strong record of participation in research. Undergraduates have made presentations at mathematics conferences and taken part in summer research experiences for undergraduates (REUs) at top universities. Graduates have been accepted by top PhD programs; two recent math majors received NSF Graduate Fellowships to sponsor their studies and research.

TRAINING THE NEXT GENERATION OF MATH EDUCATORS

TIME 2000, an integrated undergraduate program unique to Queens College, has a twofold goal—to prepare strong mathematics students to become expert secondary mathematics teachers, and to cultivate leaders who love the subject and understand its importance. Participants have opportunities for fieldwork, seminars, peer and faculty advisement, tutoring, and student teaching. Since its inception, 135 students have completed the program. Currently, 117 of them are full-time math teachers. TIME 2000 students give presentations at local and national mathematics education conferences, offer workshops on staff development days, and write journal articles. Two of our students have received the prestigious Association of Mathematics Teachers of New York State Scholarship Award. Alumni have received National Board Certification, won a Math for America Fellowship, and created teaching videos featured on PBS.

Physics

To understand the world of the future, we must consider its physical possibilities. Our faculty members are key innovators in the fields of photonics, nanotechnology, solid-state physics, electronics, and magnetism—with applications for computers, health care, and many other key technologies. Department labs provide our students with the opportunity to work at the frontiers of research.



FRED CADIEU'S LAB uses sputtering and pulsed laser deposition to develop new magnetic thin film materials and magnetic memory structures.

LEV DEYCH studies various aspects of the interaction of light and matter including the mechanical action of light.

AZRIEL GENACK'S LAB carries out microwave and optical measurements in order to understand the nature of energy transport in disordered and periodic structures.

IGOR KUSKOVSKY'S LAB studies the fundamental properties of essential building blocks of nanophotonic devices such as quantum dots, nanocrystals, nanowires, and nanorods.

ALEXANDER LISYANSKY demonstrated the dual possibilities of chaotic and synchronized behavior of a newly discovered nanometallic device, the SPASER, in an external driving optical field.

LEV MUROKH'S GROUP studies optical and transport properties of nanoscale structures, including energy conversion processes in living organisms.

VINOD MENON'S LABORATORY for Nano and Micro Photonics explores the interaction of light and matter in microcavities and waveguides and in artificially engineered optical metamaterials.

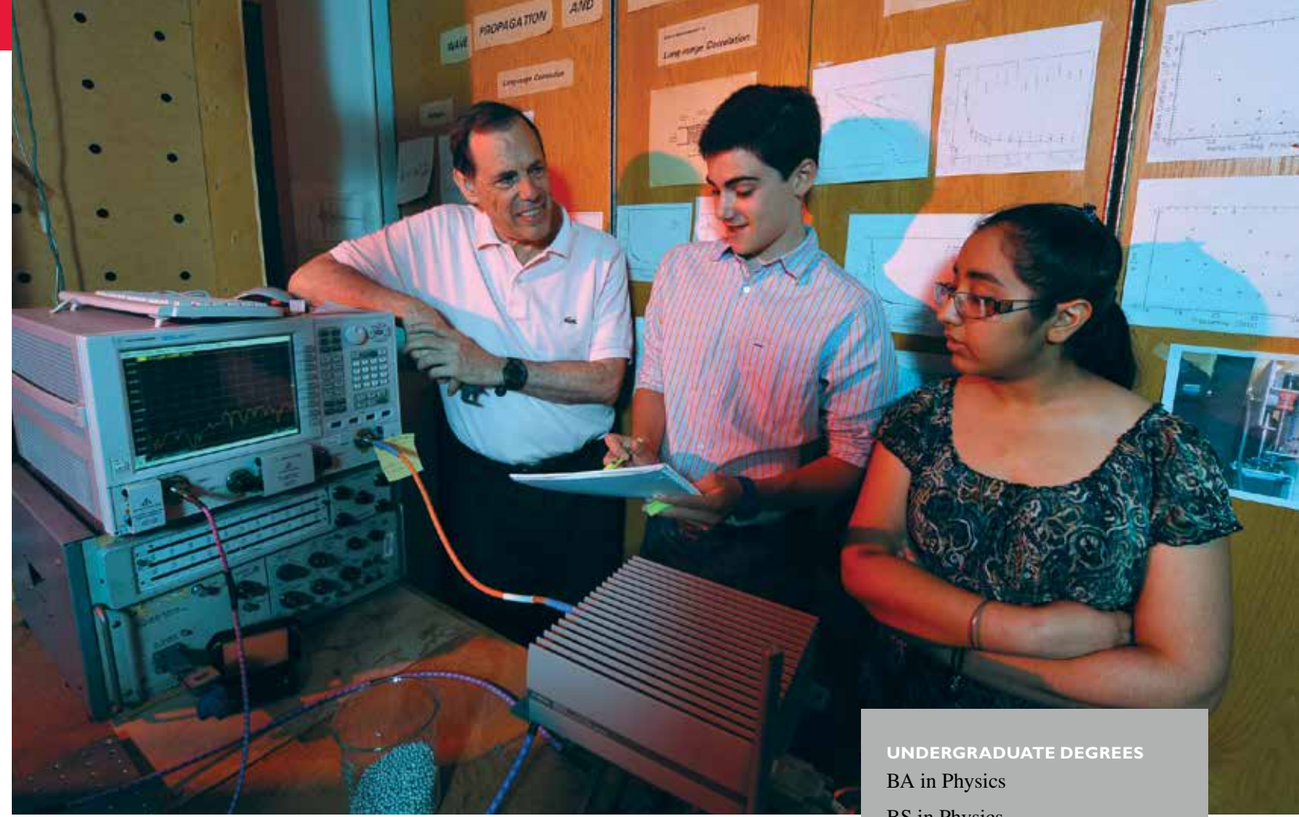
LUAT VUONG'S LAB studies the self-assembly and pattern-formation dynamics of chiral nanocomposites such as solution-processed metamaterials.

FACULTY AND STUDENT ACCOMPLISHMENTS

Alex Lisyansky, Vinod Menon and **Lev Deych** demonstrated, in a paper published in *Nature Photonics*, the formation of coupled light-matter excitations in materials with periodically modulated optical properties. Deych and a graduate student, **Joel Rubin,** have also demonstrated that the confinement of light in optical microcavities significantly modifies the optical forces in such systems.

RESEARCH ON FUTURE SOLAR-CELL TECHNOLOGIES

Luat Vuong [this page, on right] received a National Science Foundation CAREER Award for her research on finding new ways to control photo-induced electron dynamics in porous silica and solutions of nanoparticles. Her goal is to understand how self-assembly dynamics can be leveraged toward the design and development of next-generation solar cells and organic electronics. This research has applications for low-power sensors and photocatalytic chemical reactions, including new solar cell technologies. Most commercial solar cells require significant processing in device fabrication or for materials synthesis.



UNDERSTANDING THE SCATTERING OF WAVES

An inescapable part of our environment, the multiple scattering of waves affects our ability to communicate and image and to create electronic and photonics devices.

Azriel Genack [photo above, left] studies the propagation of microwave radiation and light to obtain a common framework for propagation and localization in random and periodic systems. His lab has recently identified the oscillation modes of the electromagnetic field within random samples, as well as the natural transmission channels through disordered systems. This work has direct applications to wireless communication and biomedical imaging.

STUDYING SYSTEMS AT THE NANO-SCALE

Lev Murokh is involved in several projects concerning the physics of nanosystems. Recently, his interest in nanomechanics has been extended to living objects. He examines the energy conversion processes in mitochondria membranes, in which energy is sequentially transferred from electrons to a proton gradient, to a rotation of a nanomotor, and finally to the energy of chemical compounds. He also studies light harvesting in natural and artificial photosynthetic complexes with special attention to quantum and collective phenomena. In addition, he proposes to use electrons confined in semiconductor quantum dots as a quantum simulator to model chemical reactions.

UNDERGRADUATE DEGREES

BA in Physics

BS in Physics

BA in Applied Physics

BA in Physics Education

TRANSFER PROGRAMS

Pre-Engineering Program

UNDERGRADUATE MINOR

Physics

GRADUATE DEGREES

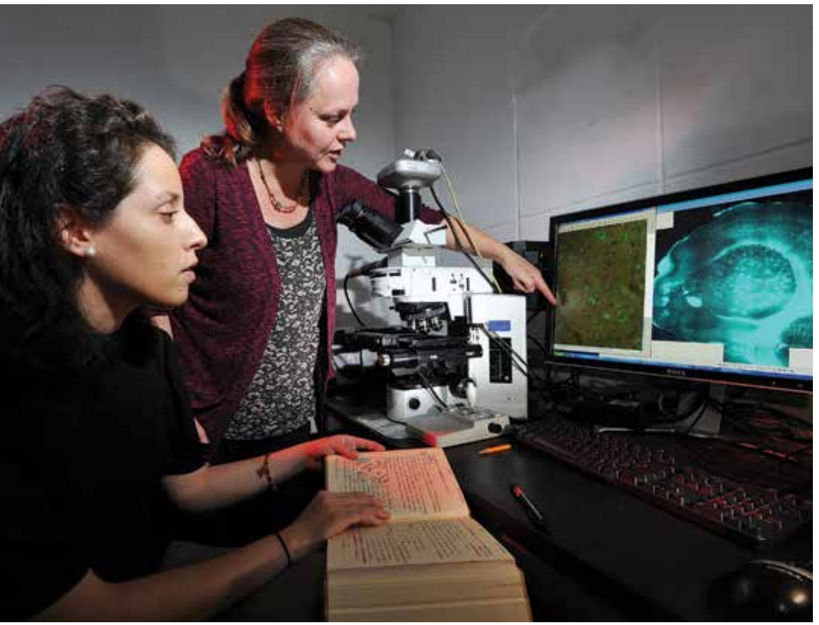
MA in Physics

Professional Science Master's (PSM) in Photonics

PhD in Physics

Psychology

The study of psychology focuses on understanding the origins and treatments of behavior. Students at Queens College can pursue bachelor's and graduate degrees in Psychology and can participate in research in labs focusing in areas such as those listed below.



THE NEUROPHYSIOLOGY LABORATORY examines the development, plasticity, and integration of sensory and motor systems.

THE VISUAL PERCEPTION AND PSYCHOPHYSICS LABORATORY investigates the mechanisms underlying how we visually perceive objects.

THE AFFECTIVE NEUROSCIENCE LABORATORY studies effects of emotions on cognitive processing.

THE LEARNING MOTIVATION AND ADDICTION LABORATORY examines reward-related learning, motivation and implications for drug addiction.

THE LIFESPAN DEVELOPMENT AND PSYCHOPATHOLOGY LABORATORY studies the diagnosis and treatment of late-life depression.

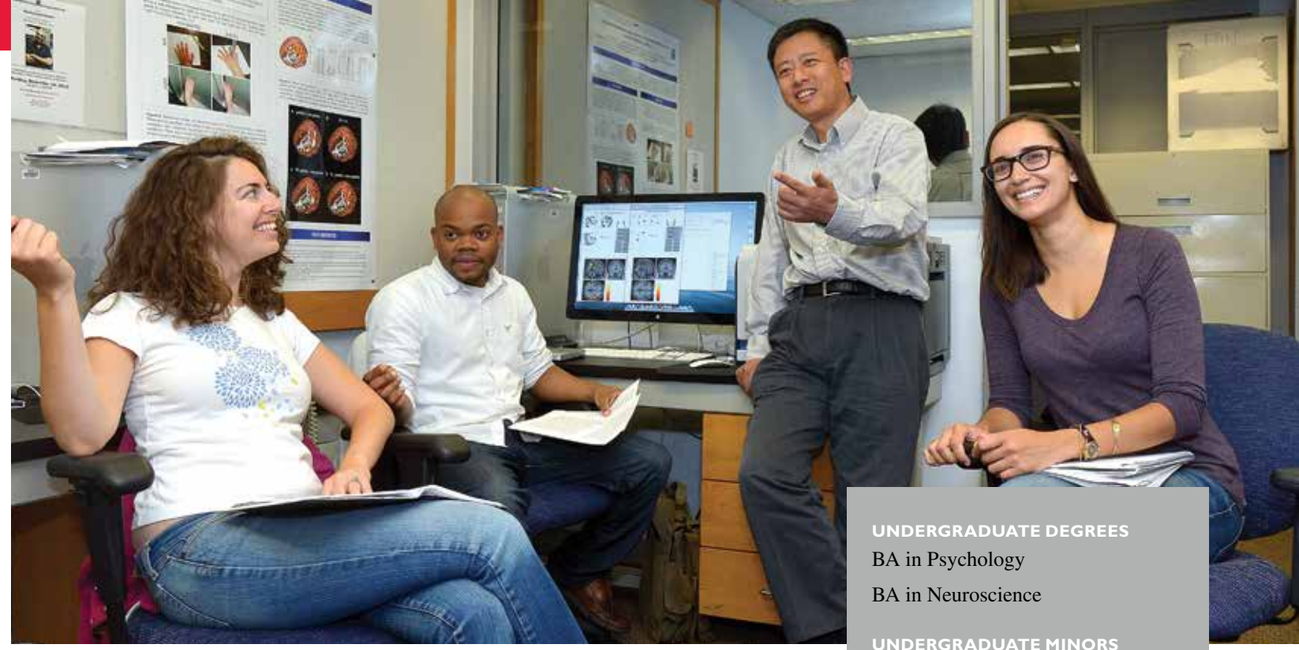
THE CHILD INTERVENTION PREVENTION AND SERVICES LABORATORY develops interventions for treatment of disruptive behavior disorders.

OBSERVING THE BRAIN AT WORK

Several of our faculty work in the emerging field of cognitive and affective neuroscience, which uses brain-imaging techniques to identify and study the brain networks underlying psychological phenomena. With measures of blood flow within the brain (functional magnetic resonance imaging or fMRI), **Jin Fan** [top of opposite page, standing] examines how emotion influences attentional processes. **Justin Storbeck** [bottom of opposite page] uses the electroencephalogram (EEG) and event-related potentials (ERPs)—which quantify electrical responses generated within the brain by external and internal events—to determine how the ability to control one's behavior is influenced by feelings and mood, and to examine deficits in emotional processing, like recognizing fear expressions, for individuals with a disease that attacks brain areas critical for emotional processing. ERPs allow **Ray Johnson** to explore a variety of cognitive processes, including memory retrieval and the cognitive and control processes used to make memory-based decisions. He also examines the cognitive and neural processes used when people are deceptive in a variety of circumstances.

NEW PROGRAMS FOR CHILDREN WITH DEVELOPMENTAL DISABILITIES

Emily Jones develops and examines interventions that maximize outcomes for children with developmental disabilities. Her research includes targeting critical early deficits in children with such conditions as autism and Down syndrome. Parents and siblings play a key role in intervention. With funding from Autism Speaks, the Doug Flutie Jr. Foundation, the Organization for Autism Research, and PSC-CUNY, Jones and her lab developed a support program for children with autism and their siblings. Findings show improvements in overall sibling adjustment and interactions. The lab is now examining the combined effects of providing support and sibling instruction, and is expanding the program to children with Down syndrome and their siblings.



STUDYING THE BIRTH OF NEW NEURONS

With funding from the National Institute of Neurological Disorders and Stroke Research, the Laboratory of Adult Neurogenesis focuses on understanding the function and regulation of new neurons born in the adult brain. **Carolyn Pytte** [opposite page] and the students in her lab study new neurons that are incorporated into the motor pathway and basal ganglia underlying the production of learned song motor patterns in songbirds. The research focuses on the factors that increase or decrease the life span of new neurons and whether they contribute to learning and memory. One goal of this work is to determine whether incorporating new neurons into existing circuits disrupts the long-term memory contained in those circuits, or helps to maintain memories encoded long before those neurons were born.

FACULTY ACCOMPLISHMENTS

More than half of our faculty have won prestigious grants from the National Science Foundation (NSF), the National Institutes of Health (NIH), and the Center for Disease Control (CDC). Among the most recent awards, **Anil Chacko** received awards from NIH and CDC to fund his research in psychosocial treatments for attention-deficit/hyperactivity disorder and child maltreatment prevention, respectively, and **Yoko Nomura** received multiple awards from NIH to fund her research in in-utero origin of neurobehavioral disorders in children.

UNDERGRADUATE DEGREES

BA in Psychology

BA in Neuroscience

UNDERGRADUATE MINORS

Psychology

GRADUATE DEGREES

MA in General Psychology

MA in Behavioral Neuroscience

MA in Applied Behavior Analysis

PhD in Clinical Psychology with Emphasis in Neuropsychology

PhD in Behavior Analysis

PhD in Behavioral and Cognitive Neuroscience

PhD in Basic and Applied Social Psychology

PhD in Health Psychology and Clinical Science

ADVANCED CERTIFICATES

Applied Behavior Analysis

ALUMNI ACCOMPLISHMENTS

Our psychology majors have entered fields such as law, medicine, dentistry, and optometry, as well as graduate programs in psychology, mental health counseling, and neuroscience, at schools such as Harvard, Columbia, New York University, Albert Einstein, Mt. Sinai, Duke, and the Stony Brook, Buffalo, and Downstate branches of SUNY. Other alums have gone on to post-graduate fellowships at Rockefeller University and the Henry Ford Clinic and Hospital, and careers in academia and industry.

New Initiatives

THE STRATEGIC PLAN

The National Science Foundation, the National Institutes of Health, the Sigma Xi Scientific Research Society, CUNY Vice Chancellor of Research Gillian Small, and many others emphasize that progress on important problems in 21st-century science requires expertise in many different fields.

The Division of Mathematics and Natural Science therefore plans to significantly expand four of our existing interdisciplinary areas through faculty hires, building renovations, and fund-raising. This will position us for success in teaching, training students to work in teams, research, and achieving more external funding from government, foundations, and industry.

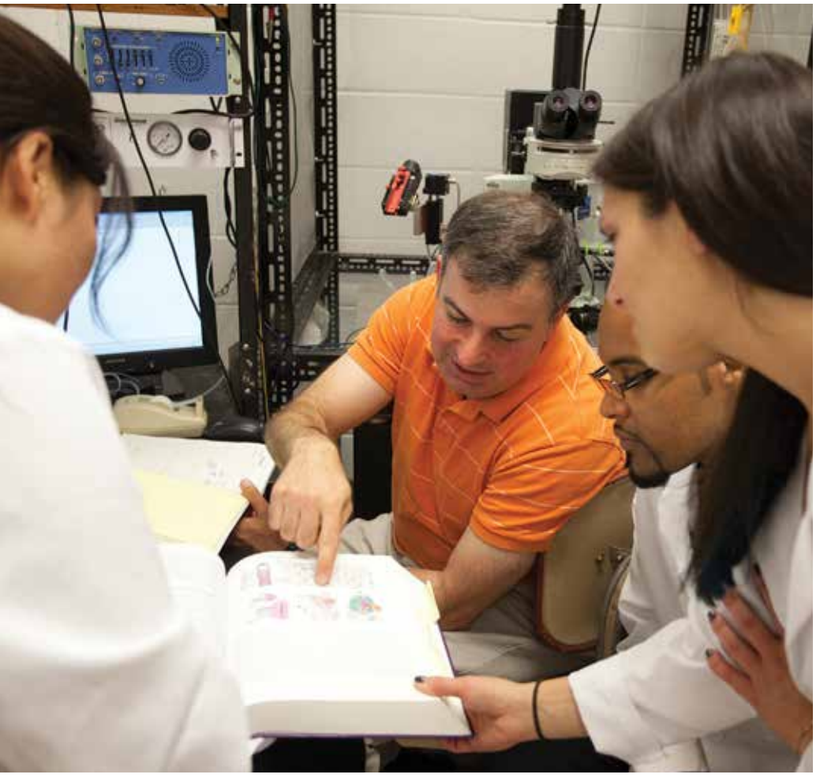
Based on our current strengths, the four priority areas for development are neuroscience, photonics, scientific computation, and urban ecosystems.

	Neuroscience	Photonics	Scientific Computation	Urban Ecosystems
DESCRIPTION	How behavior depends on genetics, cells and biological molecules.	Nanostructures to produce and control light.	Simulations of biology, chemistry, environment, physics, and natural language.	Plants, animals, people, water and air quality in New York City.
IMPORTANCE	Neuroscience is an inherently interdisciplinary science utilizing biochemistry, genetics, anatomy, physiology, behavior, modeling and computation to understand normal and pathological states. It is a high priority for funding by federal and private agencies.	Photonics and nanodevices are central to basic research in physics, chemistry and biology and to applied research in telecommunications, information processing, sensing, imaging, medical diagnostics, and energy efficiency. Photonics is one of the flagship-initiative research areas under the CUNY Decade of Science program.	Advanced computational modeling and simulation is transforming how research is conducted in all the sciences. Computational infrastructure and academic expertise are needed to harness these technologies and successfully compete for research funding.	These studies address critical issues of environmental sustainability, ecosystem degradation, land use, environmental public policy and economics. This requires a combination of expertise in many different disciplines that span traditional departments.
CURRENT STRENGTHS	■ Undergraduate Neuroscience Major ■ Neuropsychology PhD Program ■ Molecular (Bio, Psych) ■ Clinical (Psych)	■ Photonics Devices (Phys) ■ Photonics Materials (Phys) ■ Photonics Theory (Phys)	■ Natural Language Processing (CS) ■ Ecological Models (Bio) ■ Reaction Models (Chem) ■ Environmental Models (SEES)	■ Environment (SEES, CBNS) ■ Ecosystems (Bio) ■ Policy (Urban Studies)
NEW HIRES (ASST. PROF.) 2011-2012	■ Behavioral Neuroscience (Psych) ■ Clinical Director (Psych)		■ Computer Modeling (CS) ■ Natural Language Processing (CS)	■ Environmental Remediation (SEES)
2012-2013	■ Neurological Models (Psych) ■ Biostatistics (Math)	■ Photonic Materials (Phys) ■ Biological Nanomaterials (Chem)	■ Ecological Modeling (Bio) ■ Applied Math (Math)	■ Surface Geology (SEES) ■ Family (FNES)
2013-2014	■ Cellular/Molecular (Bio) ■ Nutrition (FNES)	■ Experimental Biophotonics (Bio) ■ Ultrafast Spectroscopy (Chem)	■ Quantum Chemistry (Chem) ■ High Performance Computing (CS)	■ Marine/Estuary (EES, Bio) ■ Economics (Econ, Urban Studies)
FACILITIES	Renovated space in Razran Hall	Renovated space in Science Building	Renovated space in Science Building	Renovated space in Remsen Hall

Neuroscience

Biological and psychological research from the molecular level to the bedside

Neuroscience research at Queens College extends from the cellular level to the systems level, in animals and humans. Studies of healthy people and patients groups are being conducted across the life span, from preschool children to elderly persons with Alzheimer's disease. In recent years, an increasing number of the faculty have obtained external funding for their research from agencies such as the National Science Foundation, private foundations and the National Institutes of Health (NIH), the world's premier biomedical research institute.



Ongoing basic research at the cellular level seeks to understand such issues as how new cells are generated across the life span, how environmental influences shape neuronal structure and function, and what brain mechanisms underlie appetitive behavior, addiction and learning. At the systems level, faculty research looks at a variety of higher perceptual, cognitive and affective processes.

Increasing emphasis on "translational research" is supporting efforts to identify the causes of psychological disorders—and targets for new treatments.

Josh Brumberg [on the left, pointing] and his students at the Laboratory of Cortical Circuitry study the neurons of the mouse barrel cortex, with an emphasis on the interactions between the sensory and motor systems.

Participating Departments

- **Psychology**
- **Biology**
- **Chemistry and Biochemistry**
- **Computer Science**
- **Anthropology**
- **Family, Nutrition and Exercise Sciences**

DEGREE OPTIONS

The Psychology Department has created a spectrum of neuroscience degree programs to meet the goals of students at a variety of levels. The success of these programs is illustrated by the fact that students at all three levels present their work at national and international conferences and publish in major scientific journals.

BA IN NEUROSCIENCE

This interdisciplinary, honors and research-based major is designed for students seeking intensive experience in neuroscience research. Majors must perform neuroscience-related research for a minimum of one year, culminating in a written thesis. This rigorous training is designed to make students more competitive for MA, PhD, or MD programs, or for employment in neuroscience laboratories and companies in the private sector.

MA IN BEHAVIORAL NEUROSCIENCE

This program is designed to allow master's students to work alongside world-famous neuroscientists in intensive, research-based study. In addition to required and elective courses, students must complete a minimum of one year of research culminating in a master's thesis.

PHD IN NEUROSCIENCE

Queens College faculty members participate in the CUNY PhD program in Behavioral and Cognitive Neuroscience, and Queens College hosts the PhD program in Clinical Psychology with emphasis in Neuropsychology. These programs focus on the neural basis of psychopathology and cognitive dysfunction, while training students to apply their knowledge in assessment and treatment settings. Graduates go on to successful careers in academia, clinical practice, and biotechnology.

NEW INTERVENTIONS FOR CHILDREN WITH ADHD

Professor **Anil Chacko** and Distinguished Professor **Jeffrey Halperin** [pictured above, on left and right] conduct research on neuropsychiatric disorders that emerge during childhood and often persist throughout the life span. Using clinical and neuroscientific techniques within the context of studies that follow children over many years, Halperin has elucidated the family and environmental factors that influence the psychiatric outcomes of children with attention deficit hyperactivity disorder (ADHD) and related behavioral problems. He has also employed neuroimaging techniques to examine differences in brain function between children with and without problematic behaviors persisting into adulthood. This work has led to the development of a novel drug-free intervention for preschoolers with ADHD. His research has been consistently supported by the NIH for more than 20 years.

NEUROSCIENCE CONFERENCE

Each fall, the CUNY neuropsychology PhD subprogram hosts a conference at Queens College, giving students and faculty in the program a forum for presenting their latest and most exciting research.

FOR MORE INFORMATION

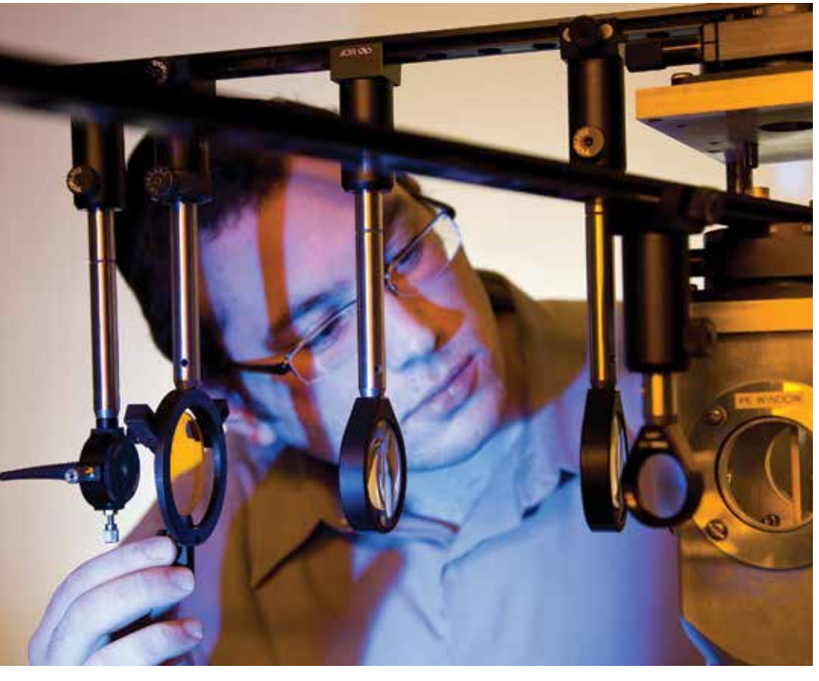
To learn more about the new interdisciplinary research cluster in neuroscience, you may contact:

Joshua Brumberg, PhD
Professor of Psychology
718-997-3541
joshua.brumberg@qc.cuny.edu

Photonics

The interaction of light with matter lies at the heart of several fundamental processes (e.g. , photosynthesis) and technological applications (e.g., solar cells).

Day-to-day applications of photonics—the science and technology of manipulating light—range from medicine to display technology to entertainment. Several photonics researchers at Queens College are working toward understanding the fundamental nature of this interaction and methods to control it, using a combination of theoretical and experimental expertise. Their research will help develop next-generation solar cells, flexible display technologies, sub-systems necessary for quantum information processing, and theoretical tools to understand the interaction of light at the nanoscale. Experimental infrastructure and academic expertise are needed to harness these technologies and successfully compete for research funding.



STUDY OF LIGHT-MATTER INTERACTION FROM THE NANO- TO MACRO SCALE

This new interdisciplinary cluster at DMNS will approach this area from three perspectives:

- **Nanomaterials**
  Development of nanomaterials that will help further photonic applications in areas such as medicine, telecommunications and imaging.

- **Photonic Structures and Devices**
  New class of photonic structures and devices based on light localization, optical forces and confining light at the nanoscale.

- **Educational and Outreach Initiatives**
  New educational experiences and course-work for students in the sciences and other disciplines.

CURRENT RESEARCH STRENGTHS

- **Nanocomposites**
- **Metamaterials**
- **Plasmonics**

- **Light Localization**
- **Cavity-Optomechanics**
- **Photovoltaics**
- **Spectroscopy**

EXPERIMENTAL PHOTONICS: NANOCOMPOSITES AND METAMATERIALS

Vinod Menon, Physics

Vinod Menon [photo above, third from left] explores light-matter interaction at the nano- and micron scale. The research focuses on the development of: (i) light-confining structures such as microcavities and waveguides and (ii) artificially engineered optical materials such as metamaterials and hybrid (organic/inorganic) nanocomposites. The motivation for this research is the development of high-efficiency classical and nonclassical light sources, enhanced nonlinear optical devices, and small footprint photonic integrated circuits. The lab's research has been supported by the NSF, the Air Force Office of Scientific Research, and others.

THEORETICAL PHOTONICS: PLASMONICS AND LIGHT LOCALIZATION

Alexander Lisyansky, Physics

Recent discoveries in nanoplasmonics have raised high hopes for the future development of ultrafast and ultrasmall optoelectronic devices. The SPASER (Surface Plasmon Amplification by Stimulated Emission of Radiation) is one of the most striking advances in nanoplasmonics. Lisyansky studies the interaction of the SPASER with external electromagnetic waves. He is also involved in studying light propagation and localization in resonant photonic crystals, as well as the general theory of localization.

THEORETICAL PHOTONICS: CAVITY-OPTOMECHANICS

Lev Deych, Physics

Deych's research examines how confinement of light affects its interaction with matter. He is interested in the mechanical action of light confined within micron-sized spherical and other axial symmetric optical resonators. He hopes to develop a new mechanism for optical cooling of mechanical motion and improved optical sensors of biological and chemical agents. His work is also concerned with the role of confinement on optical properties of semiconductor heterostructures.

EXPERIMENTAL PHOTONICS: CONDENSED MATTER AND PHOTOVOLTAICS

Igor Kuskovsky, Physics

Igor Kuskovsky conducts experimental investigations into fundamental and practical aspects of type-II semiconductor nanostructures. His group currently investigates the Aharonov-Bohm effect and its manifestation in excitonic emission of type-II quantum dots and development of high-efficiency solar cells using doped type-II quantum dots based on intermediate band.

FUTURE AREAS OF DEVELOPMENT AT DMNS

- **Next-generation solar cells**
- **Biophotonics**
- **Metamaterials**
- **Imaging**

PROFESSIONAL SCIENCE MASTER'S DEGREE

The Physics Department at Queens College now offers a Professional Science Master's Degree (PSM) in Photonics.
http://www.qc.cuny.edu/Academics/Degrees/DMNS/Physics/Photonics

FOR MORE INFORMATION

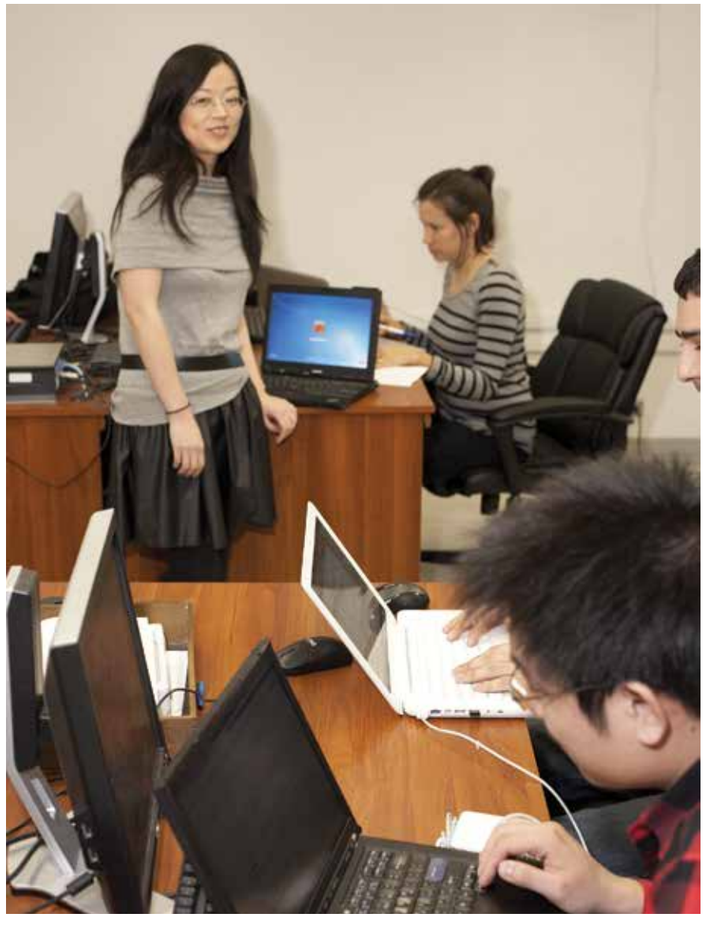
To learn more about the new interdisciplinary research cluster in photonics, you may contact:

Alexander Lisyansky, Chair
Physics Department
718-997-3371
alexander.lisyansky@qc.cuny.edu

Scientific Computation

Simulations of biology, chemistry, physics, environment, and natural language

Advanced computational modeling and simulation is transforming the way research is conducted in all the sciences. Computational infrastructure and academic expertise are needed to harness these technologies and successfully compete for research funding.



This new interdisciplinary cluster at DMNS will approach this area from three perspectives:

- **Hardware/software/methodology for large-scale interdisciplinary applications:** computational research on cloud computing, high-performance computing, distributed systems, modeling, simulation, visualization, and related topics.

- **Computation as an effective means of scientific discovery:** research on bioinformatics, quantum chemistry, natural language processing, neuroimaging, geographical information systems, and other computational sciences.

- **Thinking computationally:** New educational experiences and coursework for students in the sciences and other fields.

PARTICIPATING DEPARTMENTS

- **Biology**
- **Chemistry and Biochemistry**
- **Computer Science**
- **Earth and Environmental Science**
- **Mathematics**

CURRENT RESEARCH STRENGTHS

- **Ecological modeling**
- **Chemical reaction theory**
- **Environmental modeling**
- **Natural language processing**

THE FUTURE OF SCIENCE AND ENGINEERING

Computational thinking is the future in various scientific disciplines. Large-scale computer resources that enable the division and parallelization of big problems have enabled key advancements in modern life. For instance, our ability to quickly search for information on the Internet is due to sophisticated computing systems. Powerful computational resources have also revolutionized the fields of design and engineering, which rely on computer-assisted design tools and simulation technologies to speed the development of safer and more efficient aircraft and other complex systems. Most significantly, powerful computational processing and simulation technologies have changed discovery routes. Many fields have seen a shift from traditional research paradigms focused solely on the laboratory bench; modern computer modeling and visualization techniques are enabling scientists to identify new patterns, hypothesize new models that explain preexisting data sets, and tackle large and complex problems that would have been otherwise intractable.

CHEMICAL REACTION THEORY

Seogjoo Jang, Chemistry and Biochemistry

Photosynthetic plants and bacteria convert solar energy into chemical energy with almost perfect efficiency, but the detailed molecular-level mechanism of such conversion has remained unknown for decades. Thanks to recent developments in X-ray crystallography and spectroscopy, more structural and dynamical information is now available. To account for this data, Jang's lab designs new theoretical models—including a successful quantum mechanical model for the light-harvesting complex 2 (LH2) of purple bacteria. Because of the substantial complexity and disorder in light-harvesting systems, his laboratory employs parallel computing clusters to enable simulations. In this way, scientific computing can help to uncover the great mystery of photosynthesis.

NATURAL LANGUAGE PROCESSING

Liang Huang [pictured above, center] studies efficient techniques for parsing large quantities of text, a necessary step for various computational linguistic applications. His Algorithms for Computational Linguistics (ACL) group studies theoretical and practical problems in structured learning with inexact search that arise in computational linguistics but also apply to other structured domains, such as computational biology.

FUTURE AREAS OF DEVELOPMENT AT DMNS

- **Evolutionary models**
- **Applied mathematics of model simulations**
- **Theoretical quantum chemistry**
- **High-performance computing**

FOR MORE INFORMATION

To learn more about the new interdisciplinary research center on scientific computing, you may contact:

Zhigang Xiang, Chair
Computer Science Department
718-997-3501
zhigang.xiang@qc.cuny.edu

Urban Ecosystems

Studying our environment in an urban context: human impacts and consequences

An emerging field, urban ecosystems involves the study of humans and nature in cities, as well as the coupled relationships between humans and nature. Developing an integrated understanding of the intersections between human and ecological processes is critical to finding solutions to environmental degradation, maximizing environmental benefits, and creating more sustainable cities. Urban ecologists explore how demographic shifts, health disparities, transportation access, and the urban economy and labor markets map onto the environmental geography of the city. They look at the institutional and political contexts of environmental policy making, the multiple stakeholders (public agencies, elected officials, community organizations, advocacy groups, etc.) involved in urban environmental issues, and policy solutions such as smart growth, pedestrian-friendly cities, inclusionary zoning, congestion pricing, alternate energy policies, and green manufacturing.

PARTICIPATING DEPARTMENTS AND CENTERS

- **School of Earth and Environmental Sciences**
- **Program in Urban Studies**
- **Center for the Biology of Natural Systems**

CURRENT RESEARCH STRENGTHS

- **Environmental justice**
- **Urban water quality**
- **Urban air quality**

Queens College's urban location and environmental research strength create exciting opportunities in urban ecosystems.

URBAN WATER QUALITY

Timothy Eaton, Earth and Environmental Sciences

Groundwater and surface water systems are often highly transformed by urbanization. For instance, changes in land use can affect runoff, and changes in municipal water supply sources can cause aquifer (underground water source) drawdown and recovery. Water quality in urban estuaries depends on the amounts and quality of water discharge into them. In both Flushing Bay and Alley Creek/Little Neck Bay on the north shore of Queens, water quality has been severely degraded by many decades of discharges from combined sewer overflows. However, major improvements are currently being made in the stormwater infrastructure to retain and treat these discharges, which are projected to increase. Timothy Eaton [opposite page, in boots] and his students are studying the salinity and water quality in the Alley Pond Park wetlands as a result of these changes.

In another line of research, Eaton studies shallow aquifers in urbanized environments. Up to 20 percent of New York City's land surface is composed of artificial fill that has replaced tidal wetlands. Groundwater flows through these fill materials, the properties of which are not well known. Eaton uses ground-penetrating radar and other techniques to image and distinguish different types of materials, helping him understand their impact on groundwater quality.

ENVIRONMENTAL JUSTICE

Melissa Checker, Urban Studies

In cities across the world, environmental burdens and benefits are unevenly distributed. Poor people and people of color tend to live in areas with more waste transfer and treatment facilities, power plants, factories and other hazardous waste-producing entities. This population is also more vulnerable to natural and technological disasters and severe weather events. More affluent urbanites, however, enjoy easier access to green spaces, scenic waterfronts, and other environmental amenities. A new social movement has emerged to combat these inequalities, bringing together civil rights and environmental activism. Melissa Checker explores this movement, studying the policies, ideas, beliefs and practices that have created uneven urban geographies, their cumulative effects on people's lives, and how people are fighting back and claiming their right to cleaner and healthier environments. Her current research focuses on New York City, especially Harlem, the South Bronx and Staten Island's North Shore. Checker has documented the history of environmental siting in these neighborhoods, connecting it to historic discrimination and profit-minded development. She works to understand how members of these communities have come together to oppose the uneven distribution of environmental burdens in their neighborhoods.

CENTER FOR THE BIOLOGY OF NATURAL SYSTEMS

The Center for the Biology of Natural Systems (CBNS) is an environmental and occupational health research institute at Queens College, with a mission of identifying and helping to rectify environmental and occupational threats to human health. CBNS uses real-world problems as its entry point for needed research, emphasizing a scientific approach that facilitates public participation in gathering information and developing solutions. CBNS has received significant federal and state funding to carry out important environmental and health projects, including: monitoring the air quality of New York City's boroughs at street-level elevation, monitoring and addressing the health risks of first responders at the World Trade Center and workers at U.S. nuclear weapon facilities, and documenting the health effects of increased use of public transportation. The director of CBNS, **Steven Markowitz** [photo above, foreground] is a physician specializing in occupational and environmental medicine.

FOR MORE INFORMATION

To learn more about the new interdisciplinary research center on urban ecosystems, you may contact:

Tim Eaton
School of Earth and Environmental Sciences
718-997-3300
Timothy.Eaton@qc.cuny.edu

Why Queens College?

Queens College's challenging academic programs, world-class faculty, and top support system are here to make sure you receive a world-class education. You will graduate with the skills for a lifetime of learning—skills that top companies and the best graduate schools are looking for:

- a critical, problem-solving intelligence
- an aptitude for learning the latest technologies
- an appreciation of different cultures.

WORK CLOSELY WITH PROFESSORS WHO SHARE YOUR PASSIONS

Team up with our engaging faculty—a vibrant mix of exciting young scholars and master teachers—who are dedicated to teaching and to including students in their research. Our professors have received national recognition as well as funding from the National Science Foundation, the National Institutes of Health, the Departments of Education, Energy, and Defense, and many other agencies.

HONORS AND SPECIAL PROGRAMS

The Honors Program in Mathematics and the Natural Sciences enhances your education by providing opportunities for faculty mentorship, advanced research, and individualized projects. It creates a community of learners in which students enjoy small classes that emphasize discussion and projects rather than lectures. We also participate in the City University of New York's Macaulay Honors College, which offers top students a full-tuition scholarship, a laptop, a $7,500 stipend to pursue research and internships, and much more.

Supported through a grant from the National Institutes of Health, MARC-U*STAR (Minority Access to Research Careers is an Undergraduate Student Training program in Academic Research) was established to increase the number of under-represented students involved in biomedical sciences. Qualified students receive a significant stipend and special faculty advisement.

Mellon Mays Undergraduate Fellowship Program (MMUF) is dedicated to increasing the number of minority students who will pursue doctorates in the sciences. Students receive a yearly stipend and work with a faculty mentor.

THE SUMMIT RESIDENCE HALL

Many of our students commute to Queens College, but you also have the option to live in the world's greatest city at The Summit, our first residence hall. It has three low-rise wings, study lounges on each floor, its own fitness center and laundry, high-speed wireless, basic cable TV, and music practice rooms. It also offers on-site student support services and social events.
www.qc.cuny.edu/TheSummit

PAYING FOR COLLEGE

Queens College offers students a very competitive tuition, which is made even more affordable with the help of financial aid (over 60% of our students receive such aid). Indeed, the *Washington Monthly* recently ranked us number two nationwide—and first among all public colleges—for doing the best job of helping students attain marketable degrees at affordable prices. For the most up-to-date information on financial aid opportunities—including grants, scholarships, loans, and work-study opportunities—visit **www.qc.cuny.edu/fao.**

ADMISSION

Admission to Queens College is based on a variety of factors, including high school grades, academic program, and SAT or ACT scores. Freshman applications are reviewed on a rolling basis; priority is given to those who apply early. If you were educated outside of the U.S., generally you will need the same credentials as you would to attend a university in your home country.

APPLY ONLINE NOW

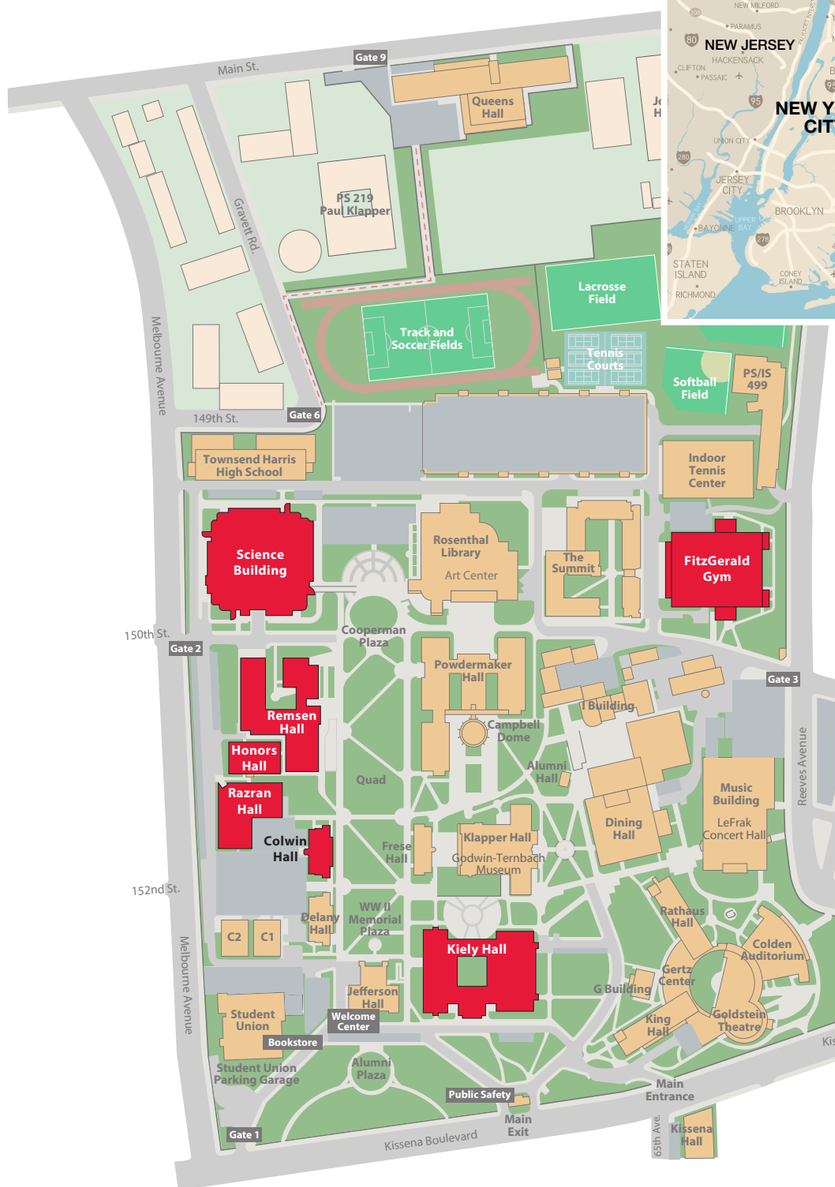
Undergraduate students:
www.qc.cuny.edu/admissions.

Graduate students:
www.qc.cuny.edu/gradapp

DEGREE	TUITION*
Undergraduate	**$5,730** per year for New York State residents **$510** per credit hour for out-of-state residents
Graduate	**$9,170** per year for New York State residents **$710** per credit hour for out-of-state residents

*Tuition and fees are subject to change without notice.

Campus Map



WE ARE HERE:

- Colwin Hall
- FitzGerald Gym
- Honors Hall
- Razran Hall
- Science Building
- Remsen Hall
- Kiely Hall

Queens College is located in the Borough of Queens, which is part of New York City.
Our beautiful 80-acre campus is about four miles from LaGuardia Airport. See videos of campus highlights at:
www.qc.cuny.edu/about/Glance/QCVideos/

Learn more about Queens College at:
www.qc.cuny.edu

Learn more about the Queens College Division of Mathematics and Natural Sciences at:
www.qc.cuny.edu/Academics/Degrees/DMNS

You can find us on Facebook at:
www.facebook.com/QueensCollegeDMNS

Information about Undergraduate Programs and Admissions is available at:
www.qc.cuny.edu/admissions/undergraduate/

Information about Graduate Programs and Admissions is available at:
www.qc.cuny.edu/admissions/graduate/welcome

QUEENS COLLEGE

CUNY The City University of New York