Dean’s Message

As indicated in the graphic accompaniment to this message, the 2009-10 academic year marked a time of transitions for the college and the division. Our presidential search produced (biologist) Lisa Staiano-Coico, (biologist) Dan Lemons became Acting Provost, and (chemist) Ruth Stark took the reins from Dan Lemons as Acting Dean of Science. Our Marshall Hall got a new curtain wall that stabilizes its outer structure and also presents a prettier face to the world, while the last beam was placed at the “topping out” of new CCNY and CUNY research buildings currently under construction on our South Campus.

The Division made impressive progress in support of CUNY’s goal of becoming a research-intensive university while serving a diverse student population better than ever. The CCNY Division of Science achieved a record-breaking $19.6 M in external research funding, a 15.4% increase over the past 3 years and 9.8% during this past academic year alone. In addition to numerous awards from the National Science Foundation (NSF) and Department of Defense, these grants to Science faculty included 6 prestigious R01 research awards from the National Institutes of Health (NIH) as well as major institutional and training awards from both NIH and NSF. Scientific discovery efforts were also evidenced by increased proportions of faculty who submitted competitive applications to agencies outside CUNY (from 45% to 69% during 2005-10), more that 3 peer-reviewed publications per reporting faculty member last year, and close to 100 undergraduate researchers working in our laboratories. The roster for our Biochemistry Seminar included two speakers who went on to receive Nobel prizes, while our Physics Department staged a world-class symposium that drew 300 attendees and was highlighted in Scientific American.

As described later in this Report, our recent graduates are thriving in prestigious doctoral programs (e.g., U. Mass. Amherst, Weill Cornell Medical School) and medical schools (Yale, Einstein, SUNYs). This past year, we graduated 129 Bachelors, 24 Masters, and 15 doctoral students. Our current undergrads served as peer mentors and peer leaders for team learning, maintained a network of clubs for premeds, chemists, and physicists, and built bridges enthusiastically to the Harlem community with a ‘Learn & Serve America’ grant project to combat obesity. These fledgling scientists and mathematicians also presented their original research findings in numerous venues: our own divisional poster session, the Annual Biomedical Conference for Minority Students, the national meeting of the Bio-physical Society, and the international Junior Scientist Conference in Vienna, Austria. In this Annual Report, we invite you to share our pride in the many impressive accomplishments of students, faculty, and staff alike.

Daniel E. Lemons,
Dean of Science Oct 2008-Apr 2010

Ruth E. Stark,
Dean of Science May 2010-Present

The City College of New York
Chapter 1

New Faculty & Staff
Andréa Marchese / Lecturer
Mathematics Department / Fall 2009

Andréa Marchese received her Ph.D. in Computational Applied Mathematics from SUNY Stony Brook in 2002. Her dissertation described a computational study of fluid mixing. After graduating she pursued a teaching career and has taught for the California State University as well as the State University of New York. Dr. Marchese is currently exploring the use of technology in the classroom. She presents class notes digitally and creates screen capture video math lessons.

David Lohman / Assistant Professor
Biology Department / Fall 2009

Before joining the CCNY biology faculty, Dr. Lohman spent four of the five previous years in Southeast Asia--first as a postdoctoral researcher in Thailand and then as a research fellow at the National University of Singapore. His research focuses on the ecology, evolution, and phylogeography of butterflies and birds in Southeast Asia. His laboratory work attempts to answer questions born from his field experience in the region.

Pat Hooper / Assistant Professor
Mathematics Department / Spring 2010

Before coming to CCNY, Dr. Hooper was an Assistant Professor at Northwestern University and a recipient of a NSF Mathematical Sciences Postdoctoral Fellowship. His research focuses on the fields of dynamical systems, geometry and topology. He studies dynamical systems and low dimensional topology and geometry with an emphasis on techniques which straddle these fields. His current interests include extending the use of renormalization techniques to better understand low complexity dynamical systems such as frictionless billiards on polygonal billiard tables.
Cédric Bernard / Research Associate
Chemistry Department / Spring 2010
Dr. Bernard obtained his Ph.D. in 2002 from the Université de la Méditerranée (Marseille, France). His thesis research used NMR methods to study the structure/function relationship of animal toxins acting against ionic channels. Following postdoctoral work in the Netherlands, he was hired as a research scientist at the French National Center of Scientific Research (CNRS) in Marseille. Dr. Bernard joined the Institute of Macromolecular Assemblies under the direction of Prof. Ruth Stark in February. He is currently studying the transport of fatty acids by different fatty acid binding proteins and coordinating research and training activities of the CUNY Institute for Macromolecular Assemblies.

Frank Pace / Accounts Receivable Specialist
Science Division / Fall 2009
After working for many years in the procurement department of the CCNY Sophie Davis School of Biomedical Education, Frank transferred to the Science Division where he helps faculty manage their research grants, with a special focus on newly hired faculty and how to best handle their diverse startup funds. Frank is also responsible for collecting fees charged to users using the Science Division shared core research facilities.
Alexey Bykov / Research Associate  
*Science Division / Fall 2009*
Alexey Bykov received his Ph.D. in Physics from the Institute of Crystallography of the Russian Academy of Science in 1982. Dr. Bykov worked as a senior research scientist at the Russian Institute of Crystallography for 13 years before joining the CCNY photonics group in 1995. His expertise is in the synthesis, crystal growth, and characterization of new materials for optical, electrical, or magnetic applications. He currently manages the X-ray diffraction, nanofabrication, and e-beam nanolithography facilities for the Science Division.

Karin Block / Assistant Professor  
*EAS Department / Fall 2009*
Prior to joining the faculty of the Earth and Atmospheric Sciences Department at CCNY, Dr. Block worked as a Postdoctoral Research Scientist for two years and Associate Research Scientist for one year at Columbia University’s Lamont-Doherty Earth Observatory (LDEO). Her area of research is in geoinformatics and cyberinfrastructure development for geochemistry.
Prior to joining CCNY, Dr. O’Brien was an associate professor of materials science and engineering in the Department of Applied Physics and Applied Mathematics at Columbia University. He received a Ph.D. from Oxford University in materials chemistry, and completed postdoctoral research in Materials Science at UC Santa Barbara and later at Columbia University and IBM TJ Watson Research Center. Dr. O’Brien is an established academic researcher in nanotechnology, with expertise in inorganic materials chemistry, materials science and engineering, and applied physics.

After working for JPMorgan Chase analyzing credit risk for the various brokerage, investment bank, and other financial service companies that partner with and borrow overnight to keep their daily operations liquid, Jonathan joined the Science Division in September. Jonathan’s main roles are to assist in managing the various budgets in the division, help faculty and staff with procuring research equipment and hiring personnel, acting as the liaison for the Division in regards to administrative matters, and making sure the Dean’s office continues to serve all of its constituents as efficiently as possible. Jonathan is also close to completion of his MBA at CUNY Baruch College in Finance & Economics.
Bianca Santoro / Assistant Professor
Mathematics Department / Fall 2009
After receiving her B.S. and M.S. from Pontificia Universidade Catolica Rio, in Rio de Janeiro, Brazil, Professor Santoro obtained her Ph.D. in Mathematics from MIT in 2006. After a semester as a postdoctoral fellow at MSRI (Berkeley, CA), she spent the next two years as an Assistant Research Professor at Duke University. Her areas of interest are complex geometry and geometric analysis, in particular the study of Calabi-Yau metrics on open manifolds, with possible applications to the construction of concrete and new examples of G2 manifolds.

Limin Huang / Research Associate
Chemistry Department / Fall 2009
Dr. Huang received his Ph.D. in Physical Chemistry from Fudan University (China) in 1997, where he was also a lecturer from 1997 to 2000. After completing his postdoctoral research at UC Riverside and Columbia University, he became an associate research scientist in the Applied Physics Department at Columbia University, working with Professor Stephen O’Brien. His current research focuses on the synthesis and processing of metal, semiconducting metal oxide and complex oxide nanomaterials for applications in energy storage and conversion.
Chapter 2

New Academic Programs
Earth System Science and Environmental Engineering (ESE)

A New Interdisciplinary Bachelor's Degree Program: [http://earth.engr.ccny.cuny.edu/eess/](http://earth.engr.ccny.cuny.edu/eess/)

Human activity is increasingly perturbing environmental systems. Deterioration of the environment through depletion of natural resources such as air, water and soil results in the destruction of ecosystems and climate change. A sustainable planet requires engineers and scientists to understand the impact of their decisions on built and natural systems. The interdisciplinary undergraduate Earth System Science and Environmental Engineering program is now one of the fastest growing programs at CCNY. The total number of students in the ESE Program has more than tripled since its inception. During the Fall 2010 semester, the program enrolled 66 students (39 males and 27 females) and graduated 10 students in AY 09-10. To date, 26 students have graduated from the ESE program. Graduates went on to professional positions as environmental engineers for city, state and federal governments and in private industry. ESE graduates have also transitioned to such programs as Columbia University’s MS in Environmental Engineering.

The ESE program was reviewed by the Accreditation Board for Engineering and Technology (ABET) in October of 2010. The visit was a success and the program is expected to be accredited in 2011.

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The City College of New York is proud to offer a new graduate program, Sustainability in the Urban Environment, which responds to increasing demand for a workforce equipped to meet the sustainability challenges of the 21st century. The 30-credit program leads to the degree of Master of Science in Sustainability. The program’s innovative, interdisciplinary curriculum draws upon emerging approaches in the disciplines of architecture, engineering and science. Its objective is to prepare students to adapt old and advance new generations of buildings, urban infrastructure and open spaces using approaches that take into account rapid urbanization, environmental degradation, peak oil, and climate change. Courses are taught by the faculties of the Bernard and Anne Spitzer School of Architecture, the Grove School of Engineering and the College of Liberal Arts & Science (Division of Science and Division of Social Science). A core curriculum lays a foundation in sustainability values, strategies and metrics through coursework in urban and natural systems, environmental economics and industrial ecology. It draws upon approaches such as ‘whole systems thinking’ and life cycle analysis to understand and evaluate complex urban eco-systems. Graduates will ultimately develop leadership and teamwork skills that will give them an advantage in diverse professional settings that demand interaction and collaboration among teams of scientists, engineers, architects and others. This timely new program is designed to meet employment demands in the Tri-State area as well as nationally. For example, New York City’s “PLANYC 2030: A Greener Greater New York,” which outlines 10 major goals and 127 initiatives to sustain and improve the quality of life in New York City, will require a host of trained professionals to achieve its objectives.

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Center for Exploitation of Nanostructures in Sensors and Energy Systems (CENSES)

Educational Programs for Ph.D. Students and Undergraduates:
http://www1.ccny.cuny.edu/ci/censes

The Center for Exploitation of Nanostructures in Sensors and Energy Systems (CENSES) is a National Science Foundation Center for Research Excellence in Science and Technology (CREST). The CENSES Core Educational Program consists of two components — The Graduate Research Fellowship and the Summer Undergraduate Research program.

CENSES Graduate Research Fellowship provides Ph.D. students from chemistry, physics and engineering with the opportunity to engage in investigation of applications of nanomaterials and nanostructures in sensor and energy systems. Since CENSES is a multidisciplinary research center, Ph.D. students have access to researchers from different disciplines in several state-of-the-art research laboratory facilities. Students are eligible for up to a $30,000 annual stipend and they participate in professional development seminars and workshops. Some Ph.D. students can also participate in extended research visits with CENSES global-partner universities in China, Mexico, and others yet to be determined. In the past two years over 30 Ph.D. students have been actively engaged in CENSES research.

Undergraduates (REU) style Summer program supports an average of 8 undergraduate students each summer to conduct research in CENSES labs. This program is a competitive 10-week summer program that recruits from a pool of undergraduate students across the United States. In addition to conducting research, the CENSES REU students participate in developmental workshop and social activities. During Summer ’10, the workshops/activities included a tour of the CCNY Molecular Beam Epitaxy (MBE) facility, a “SERS in Art and Forensics” seminar, a series of workshops on developing informative posters & presentations, a tutorial on Chem Draw, a guided tour of the Metropolitan Museum of Art, a picnic in Central Park, and a New York tradition — a Yankees baseball game.

Both the CENSES Ph.D. fellowship and undergraduate research programs strongly encourage participation by African American, Hispanic, Native American and female students.

CENSES Research Experience for

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Chapter 3

Faculty Development & Infrastructure Upgrade
The rehabilitation of the Marshak building, initiated in 2005, continued as planned throughout the 2009-10 academic year. The erection of a protective glass curtain surrounding the building was completed in June. The next major renovation step involves the upgrade of the HVAC system, which is projected to start in the Fall 2011.

While old Marshak was getting a facelift, contractors were also busy working on the internal organs; three brand new passenger elevators (out of a total of six for the entire building) became operational during the Spring semester, providing welcome relief to all the building’s occupants. The other three elevators will be replaced over the next nine months.

Marshak Facade and Elevator Construction
Forum CURES

ForumCURES is a new release of an older work order system developed by the Science Division called MarshakSci. ForumCURES (College Unified Request and Evaluation System) features multiple improvements and novel concepts to assist college faculty and staff in obtaining better service from various campus facilities. With ForumCURES, requests are placed and tracked online in a matter that promotes openness and transparency. Each request can be assigned multiple states (new, closed, open, under review) and each state transition generates messages informing all participants about the action that is being taken.

ForumCURES also features a powerful live system statistics component. Live graphs with system data are displayed on the request form before work orders are submitted. All the statistics are shown specifically for each of the request types that the user can select. This feature allows requesters to observe the volume, satisfaction, and feedback collection rates, giving a more accurate picture of how fast and how well their request is likely to be handled.

Currently ForumCURES is available for members of the Science Division. The proposed model, however, can be adapted by other divisions and schools within City College and The City University of New York.
The Science Division Teaching and Learning Advisory Committee (TLAC) was established in 2008 to address education concerns in the sciences. The overall goals of this advisory group are to help us take maximum advantage of the innovations already developed here, and to envision short and long term approaches for improving the education of the students served by the division. The advisory committee considers issues of teaching and learning in the division and offers advice to the dean on possible courses of action. Each January TLAC runs a professional development workshop, with activities geared towards improved student learning. The kick-off workshop entitled “Discussions on Student Learning” focused on making sense of how students make sense of science. Professor Richard Steinberg from Physics and Education led the morning session; Professor Federica Raia of Earth and Atmospheric Sciences led the afternoon sessions. Twenty-five junior faculty members from Science participated and a broad spectrum of pedagogy was exchanged.
Chapter 4

Bringing Science to the Community and Beyond
The Science Service Learning Project in Tanzania is a collaboration of the Division of Science with the Division of Social Science Department of International Studies and the Tanzanian government. It is offered in response to the articulated need of Tanzanian educators and Tanzanian students at CCNY who have pointed out the enormous gender gap in admissions to the one university in Tanzania that offers a science curriculum, the University of Dar-es-Salaam. The female students are ill prepared for admissions there because they study in high schools that have weak science programs and are seldom encouraged to pursue an education in the sciences.

The program is designed to give City College women students in science the opportunity to teach and serve in a culture other than their own, and to provide students in girls’ high schools in Tanzania the opportunity to learn science in an interactive environment that uses simple practical experiments to learn scientific concepts. The City College women serve as mentors to their Tanzanian students with the goal to inculcate a greater interest in science related higher education among women and encourage them to pursue university careers in the natural sciences.

The program just completed its third summer in the Tanzanian girls’ science camps. The initial challenge was to convince the local teachers used to teaching to exams, the importance of inquiry based learning that is interactive in design. By the second and third summers the CCNY women and the Tanzanian teachers worked hard and around the clock to insure the success of the camps. Prof. Fernando Director of International Studies initiated the program following her extensive service learning experiences in Rwanda and El Salvador. Because of previous work with Dr. Roth, Deputy to the Dean of Science, she asked for her cooperation in putting together this innovation in service learning. Dr. Roth recruited Professor Issa Salame, of the Department of Chemistry because of his expertise in science education. Professor Salame designed the program’s curriculum and was responsible for teacher training. He went with the students to Tanzania the first two summers, serving as coordinator and liaison with the local educators. This past summer Dr. Tonya Hendrix served as coordinator.

This program has been viewed by the Tanzanian government as a success. The CCNY women learned and experienced a new culture and recognized the importance of their contribution to the lives of the Tanzanian girls. The Tanzanian teachers learned a more effective way to teach concepts in science. In the future we hope to learn if the girls in the science camps did indeed go on to university to study science.
Five prominent physicists from leading U.S. and European universities met on April 23, 2010 at The Harmonie Club in New York to explore the future of their discipline at “Frontiers in Physics,” a daylong symposium presented by the CCNY Physics Department.

The invited speakers included David Gross, who shared the 2004 Physics Nobel Prize for his work on the strong force that led to a completely new theory, Quantum ChromoDynamics, QCD, and Andre Geim. Dr. Geim, who could not attend due to volcanic eruptions in Iceland, would be awarded the 2010 Nobel Prize in Physics a few months later for his discovery of Graphene, a material consisting of one-atom-thick layers of carbon atoms arranged in two-dimensional hexagons. That is the thinnest material in the world, as well as one of the strongest and hardest.

The other three featured speakers were Dr. Anton Zeilinger, Professor of Physics, University of Austria, and Scientific Director, Institute of Quantum Optics and Quantum Information of the Austrian Academy of Sciences; Dr. P. Leslie Dutton, Eldridge Reeves Johnson Professor of Biochemistry and Biophysics, University of Pennsylvania; and Director, Johnson Foundation for Molecular Biophysics, and Dr. Alan Guth, Professor of Physics, Massachusetts Institute of Technology.

The event also served as the occasion for the conferral of an honorary doctorate on Sy Sternberg, ’65 EE, former chairman and chief executive officer of New York Life Insurance Co.

The principal speakers, representing high-energy physics, condensed matter physics, quantum computing/quantum information, biophysics and astrophysics, assessed the state of their fields and near-term and mid-range prospects.

The event was a tremendous success, with a packed audience of over 300 attendees from start to end. The sedate atmosphere, typical of such academic gatherings, was briefly broken by a rather feisty sparring match between David Gross and Alan Guth over the latter’s model for the dawn of the universe. Although always polite and respectful, the exchange between these two heavyweights of theoretical physics sounded at times quite acerbic.

The April 30, 2010 edition of the weekly Scientific American reported about the event in an article titled “Star Physicists Trade Barbs Over Cosmological Model.”
CCNY students, faculty and administrators participated in the 2nd Junior Scientist Conference at Austria’s Technical University TU of Vienna April 7-9, 2010. Well over 200 young researchers from 14 different countries participated in this year’s conference, the fifth in a series of student research conferences with host sites that alternate between Vienna University of Technology and The City College of New York. The 2010 JSC welcomed papers on student research in the areas of Computational Science and Engineering, Materials and Matter, Information and Communication Technology, and Energy and Environment. Five CCNY students were selected for prestigious oral presentations. First and fifth place awards in the Masters division, and third place in the doctoral division, were won by CCNY students.

During this visit, our Science faculty and staff representatives also took this opportunity to strengthen collaborations with the University of Graz. Through our partnerships with TU Vienna and Uni Graz we expect strong Austrian representation at our upcoming sister conference, “Einstein’s in the City” 2011.
The City College Academy for Professional Presentation (CCAPP) Poster Presentation

The CCAPP Poster Presentation is an annual event that showcases the work of the research students in The City College of New York Division of Science. The posters are designed to describe the students’ research projects and explain the theories on which the projects are based. They also illustrate how the research is an application of those theories. With appropriate laboratory findings, Over 50 undergraduate science and math majors participate each year.

CCAPP, the City College Academy for Professional Preparation, is the student support program for the Division of Science. It is funded primarily by a CSTEP grant from the New York State Education Department. The research that is presented is supported by grants from the National Institutes of Health, the National Science Foundation, the National Aeronautics and Space Administration, the United States Department of Energy, the New York State Department of Health, the Office of Naval Research, the Community Trust and the CCNY/MSKCC Partnership for Cancer Research.
The Division of Science’s CSTEP program, the City College Academy for Professional Preparation (CCAPP), was invited to partner in a grant to the Center for Advanced Study in Education at the CUNY Graduate Center from Learn and Serve America. The purpose of the grant is to train coordinators and students to develop locally relevant health prevention service learning projects in collaboration with community-based organizations. The philosophy of service learning is to take what is learned in the classroom and apply it directly to a community service project that addresses an identified need of that community. In the first semester, the service learning course initiated by the Division of Science, Science 31300, addressed the awareness of obesity as a problem in the Harlem community.

To address the problem of obesity, the students performed a needs assessment of the priority health concerns in the community surrounding CCNY and then designed three projects to target both the community in which the college is located and the college community itself: Farmers Market, Healthy Bodega Initiative, and Healthy Campus.

For the Farmers Market the students worked with Community Board 9, the New York City Parks Department, and the Friends of Montefiore Park Association to bring a market to the community. The Healthy Bodega Initiative involved the students partnering with the New York City Department of Health and Mental Hygiene and Community Board 9 to convince local bodegas to sell healthy lunches for a reasonable price. For the Healthy Campus project, the students negotiated with the company that provides the college’s food services to install vending machines selling healthy snacks.

At the conclusion of the first semester of the division’s service learning course the students gained an increased awareness of current health issues and prevention strategies, social marketing and community outreach practices. Furthermore, they were afforded the opportunity to apply their science knowledge and skills to a real-world context and learned the importance of the community in planning and implementing projects. The course led to new partnerships with the Department of Health and other community-based organizations. For example, as a result of the students’ demonstrated abilities the health department offered them paid summer internships. These opportunities will ultimately benefit students by providing them with the skills they need to transition into their professional health and science-based careers.
Chapter

5

Centers & Institutes
Disciplines: Chemistry, Physics, and Engineering

Research Teams: 3 Sub-projects (formally called IRGs), 13 projects, 21 faculty members

Student Trainees: 49 postdoctoral, doctoral, masters, undergrad, and high school students

Annual External Funding: $1.2 million (Over $25 million since CASI’s Inception in 1988).

Collaborating Organizations: 1) Columbia University Nanoscale Science and Engineering Center (NSEC); 2) Shanghai Institute of Microsystems and Information Technology (SIMIT), which is affiliated with the Chinese Academy of Sciences; 3) NYU Materials Research Science and Engineering Center (MRSEC) REU summer programs.

Conferences, Courses, Other Public Events: 1) Dr. Maria C. Tamargo was co-Chair of the 26th North American Molecular Beam Epitaxy Conference (NAMBE2009) held on August 9-12, 2009 in Princeton, NJ. Dr. Aidong Shen is the Conference Proceedings editor for that conference. The proceedings will be published in a special (refereed) issue of the Journal of Vacuum Science and Technology. 2) Approximately 300 inner-city high school students participated in NanoDay in New York 2009 (Oct. 17). NanoDay is an all-day city-wide event designed to attract students from a broad representation of New York schools into the interdisciplinary fields of nanoscience and nanotechnology. NanoDay in New York 2009 was held at The City College of New York and was co-hosted by Dr. Daniel L. Akins, CENSES PI and Director and Dr. James Yardley, Director of the Columbia University NSEC. 3) Peer-Led Team Learning (PLTL) Program graduate studies curriculum workbook for solid state chemistry with applications in nanoscience and physical properties of materials was developed by Dr. Glen Kowach and PLTL Specialist A.E. Dreyfus. Dr. Kowach presented this pilot course as a lecture series at the Universidad Autónoma de Madrid (May 2010).

Raman spectroscopy of ammonia borane(AB) and AB-MCM41 nanocomposites. Excited at 632.8nm laser.

Research Areas

1) Sensor applications: mid-IR sensors based on wide bandgap II-VI semiconductor devices; chemical and biological sensors from single-walled carbon nanotubes; and liposome-based arrays with nanoparticle markers for toxin detection. 2) Energy systems: battery electrode nanomaterials; single-walled carbon nanotubes onto which electrocatalysts are attached for fuel cell applications; hybrid II-VI and III-V multiple quantum well/quantum dot high performance solar cells; and hydrate-based gas storage materials. 3) Emerging technologies and novel characterization technique: biologically inspired self-assembled nanostructures; cobalt-oxide-based thermoelectric materials and devices; surface-enhanced Raman spectroscopy (SERS) applied to the study on organic-inorganic hybrid nanomaterials; and Femtosecond time-resolved scanning tunneling microscopy.

http://casi.sci.ccny.cuny.edu
http://www.ccny.cuny.edu/censes
**Research Areas**

1) Use of rheology, non-Newtonian fluid mechanics, and polymer physics to solve problems of interest in polymer processing. 2) Microscale numerical simulation in fluid mechanical systems. 3) Study of jammed matter, spanning from colloidal suspensions, dense emulsions to granular materials and glasses in search of unifying theoretical frameworks.

**Disciplines:** Physics, Chemical Engineering, Bioengineering, Chemistry

**Research Teams:** 6

**Student Trainees:** 8 Ph.D. Students; 8 Postdoctoral Research Associates

**Annual External Funding:** $4 million

**Collaborating Organizations:**
1) Columbia University (IGERT); 2) University of Chicago (PREM); 3) Yale University; 4) New Jersey Institute of Technology; 5) Sandia National Laboratories; 6) ExxonMobil Research and Development; 7) Max Planck Institut – Stuttgart, Germany; 8) CNRS Laboratoire FAST, Orsay, France; 9) CNRS Laboratoire IUSTI, Marseille, France; 10) Bar Ilan University, Israel Schlumberger-Doll research; 11) Boston University; 12) NYU; 13) University of Fortaleza, Brazil; 14) University College, London; 15) Stockholm University; 16) University of Buenos Aires; 17) van der Waals-Zeeman Institute, University of Amsterdam, Netherlands.

Flow of a particle dispersion in a microfluidic device. The images show flow of a liquid containing about 10% solid particles past various obstacles of typical dimension 200 microns, showing a remarkable depletion of particles in the wake. The flow rate increases from top to bottom. A potential application would be to use the phenomenon to separate particles and fluid within a microscale device. (Shahab Shojaei-Zadeh and Jeffrey Morris)

Molecular dynamics simulation of the motion of a liquid drop on a solid surface driven by a wettability gradient; a water drop on a self-assembled monolayer of alkanethiol chains terminated with methyl or hydroxyl groups, where the (attractive) hydroxyl concentration increases from left to right.
CAISSL

Disciplines: Computer Science, Mathematics

Researchers: 24

Student Trainees: 1 doctoral student, 2 undergraduate students

Annual External Funding: varying amounts from collaborative sources including the National Science Foundation, the Provost of the City College of New York, the Dean of Sciences of the City College of New York, and the Dean of the Grove School of Engineering of the City College of New York

Collaborating Organizations: New York Group Theory Cooperative

Conferences, Courses, Other Public Events:
1) Faces of Modern Cryptography conference (CCNY, 9/09)
2) Finitely Presented Solvable Groups Conference, Where do we go from here? (CCNY, 10/09)
3) Co-Sponsored the New York Group Theory Seminar (CUNY Graduate Center, Fall 09 & Spring 10)

Research Highlights:
1) The Center for Algorithms and Interactive Scientific Software (CAISS) is a research center where mathematicians and computer scientists come together to collaborate on different projects. CAISS has been intensively engaged in its cross-disciplinary mission on an expanding international scale.
2) CAISS Director and Distinguished Professor Emeritus Gilbert Baumslag was awarded an invitation to conduct research at the prestigious Institut des Haute Etudes Scientifiques (IHES) located outside of Paris. Professor Baumslag will focus on projects blending mathematics and computer sciences while at IHES. Dr. Baumslag is expected to engage in several lectures at the University of Paris on advanced research concerning Group Theory.
3) CAISS Director Gilbert Baumslag has been engaged in on-going research in collaboration with educators in South Africa to plan a joint session of the leading mathematical societies in the United States (AMS) and South Africa (SAMS). This research is being undertaken to explore possible contributions of CAISS, and City College, in the advancement of STEM subjects in South African schools.

RCMI

Disciplines: Biology, Biochemistry, Biophysics

Researchers: 31

Student Trainees: N/A

Annual External Funding: $2 million

Collaborating Organizations: NY Structural Biology Center

Conferences, Courses, Other Public Events:

Research Areas
1) Biomolecular Structure & Function
2) Cancer
3) Neurobiology
4) Immunology

Cell and molecular biology with a focus on the mechanisms by which human cells become transformed to the malignant state: The goal of our research is to understand the process by which human epithelial cells come to acquire the properties of tumor cells derived from malignant neoplasms.
Disciplines: Physics, Electrical Engineering, Chemistry, Biology, Biochemistry

Research Teams: 10

Student Trainees: 12 postdoctoral, doctoral, masters, undergrad and high school students

Annual External Funding: $1 million

Collaborating Organizations: Columbia University, Corning, Lockheed Martin, Northrop Grumman, Intuitive Surgical, Vixar

Conferences, Courses,
Other Public Events:

Research Highlights:
The major technical accomplishments in 2010 are: fluorescence and excitation Stokes shift biopsy techniques; the design of novel twisted optical fibers for the generation of singular beams, such as Laguerre-Gaussian beams with orbital angular momentum; and the theoretical advancement in the relationship between the states of spin and orbital angular momentum of light (See Figure below for new SAM sphere representation of cylindrical vector beams as compared to the standard Poincare sphere). The black arrows represent polarization vectors and red arrows show the spatial intensity of the modes. The IUSL researchers have published over 716 papers and were awarded 107 US patents over the years.

Research Areas:

1) Crystal growth and synthesis of materials for NIR laser applications
2) Tunable solid-state laser development
3) Porous materials and ceramics
4) Optical physics of Cr4+-Doped novel type laser media
5) Hybrid organic-inorganic nanoscale optical materials
6) Nanoscale microscopy and imaging
7) Development of nanoscale ultrafast spectroscopic probing techniques
8) Semiconductor photodetectors and emitters
9) Optical mammography
10) Prostate tumor detection using spectral polarization imaging, fingerprint absorption and tumor-receptor-targeted contrast agents
11) Singular optics: phase and polarization vortices in Laguerre-Gaussian laser modes; the spin and orbital angular momentum of light

See Full Research Project List at: http://www2.ccny.cuny.edu/ci/iusl/research_main.cfm
Disciplines: Chemistry, Biochemistry, Physics, Chemical Engineering

Research Teams: 35

Student Trainees: 200 post-doctoral, doctoral, masters, undergrad, and high school students

Annual External Funding: $9 million.

Collaborating Organizations:
NY Structural Biology Center, NY Academy of Sciences, NYU-Polytechnic Institute

Conferences, Courses, Other Public Events:
1) Advances in Biomolecular Engineering: Protein Design.
2) Touring the Tomato lab course for high school students.
3) G Protein-coupled Receptors: structural biology, biochemistry, and genetics.

Research Areas

1) Natural assemblies: protein drug targets, RNA splicing and translation complexes, fungal and plant biopolymers.
2) Engineered assemblies: peptides for biosensing, drug delivery, nanoelectronics.
3) Designed proteins and polymers for energy applications.

Model comparison. (a) The cryo-EM model (EMD-1081) was low-pass filtered (gold) to match the CNS model (blue) and they were displayed in CHIMERA with the same threshold. (b) Comparison of slices of the cryo-EM structure and the cryo-negative staining models (same as a). Scale bar corresponds to 6 nm.

Cryo-electron micrograph and diffraction pattern of GroEL. (a) Cryo-negatively stained preparation with ammonium molybdate on holey carbon. (b) Typical optical diffraction pattern computed over the sample-containing area (no carbon).
Disciplines: Chemistry, Biochemistry, Physics, Biomedical Engineering, Biology, Psychology, Economics, Community Outreach

Research Teams: 15

Student Trainees: postdoctoral, doctoral, masters, undergrad, high school

Annual External Funding: $9 million

Collaborating Organizations: 1) Memorial Sloan-Kettering Cancer Center Conferences, Courses, Other Public Events. CCNY/MSKCC Cancer Health Disparities Symposium: A Translational Approach. 2) CCNY/MSKCC Summer COURT Student Research Presentations. 3) Students attend: ABRCMS – Annual Biomedical Research Conference for Minority Students (www.abrcms.org)

Research Highlights:
In the past year we have made progress towards understanding the role of the UBR1 ubiquitin ligase in mediating the degradation of misfolded proteins. Our focus has been in investigating a class of drugs that promote protein misfolding by inhibiting the molecular chaperone, Hsp90. These drugs promote rapid destruction of Hsp90 client proteins via the ubiquitin/proteasome system and our studies resulted in the discovery that UBR1 participates in this process. Our studies in yeast have revealed that some protein kinases whose folding are inhibited with the drug are susceptible to aggregation. The amount of aggregation increases by two-fold in cells deleted for the UBR1 ubiquitin ligase. In other studies, we have demonstrated that mouse cells deleted for UBR1 have increased resistance to Hsp90 inhibitors. This increased resistance correlates with a resurgence of protein kinase levels 12–18 hours after treatment, something that is not seen in wild type cells. We are currently investigating the mechanisms underlying this effect.
The Division in Numbers
Enrollment Statistics

Number of People

- Freshmen
- Transfer Students
- Undergraduates
- Masters
- Ph.D
### 2010 Science Division Graduates

#### Post Graduate Statistics

<table>
<thead>
<tr>
<th>Year</th>
<th>Graduated Students</th>
<th>Entered the Following Medical Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>17</td>
<td>Meharry, Meharry, Lincoln (DO), Downstate, UCONN, AUC, NYCOM, Yale, Penn (Dental), Stony Brook, A.T. Still (DO), Antigua, Upstate, Northeastern Ohio</td>
</tr>
<tr>
<td>2010</td>
<td>16</td>
<td>Downstate, PA Optometry, Wisconsin (Vet), Albany, Cornell (Vet), Upstate, Einstein, Ross, NYCOM, St. Louis, Penn (Medical)</td>
</tr>
</tbody>
</table>

NYCPM = New York College of Podiatric Medicine  
NYCOM = New York College of Osteopathic Medicine  
AUC = American University of the Caribbean
Faculty Statistics

Total: 105 Faculty

Percentage of Research-Active Faculty
(based on proposal submissions)
2005-2010 Funding & Proposals

<table>
<thead>
<tr>
<th>External Funding By Year</th>
<th>2005-06</th>
<th>2006-07</th>
<th>2007-08</th>
<th>2008-09</th>
<th>2009-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Departments</td>
<td>12,908,828</td>
<td>9,673,546</td>
<td>7,540,995</td>
<td>13,602,444</td>
<td>15,941,452</td>
</tr>
<tr>
<td>Institutes</td>
<td>6,233,150</td>
<td>7,138,337</td>
<td>4,820,697</td>
<td>3,907,556</td>
<td>3,334,895</td>
</tr>
<tr>
<td>Dean</td>
<td>223,250</td>
<td>379,881</td>
<td>360,972</td>
<td>697,481</td>
<td>606,158</td>
</tr>
<tr>
<td>Total</td>
<td>19,365,228</td>
<td>17,191,764</td>
<td>12,722,664</td>
<td>18,207,481</td>
<td>19,882,505</td>
</tr>
</tbody>
</table>

Science Division External Funding

![Science Division External Funding Graph]

Number of Submitted Proposals

![Number of Submitted Proposals Graph]
**Hours on Use of Equipment**

- **Total:** 15872.5 hours

<table>
<thead>
<tr>
<th>Equipment Available</th>
<th>Major Core Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zeiss LSM 510 System</td>
<td>Confocal Microscopy Laboratory</td>
</tr>
<tr>
<td>MonoVista CRS-Upright SP 2750</td>
<td>Confocal Raman Microscopy Laboratory</td>
</tr>
<tr>
<td>Zeiss Supra 55 SEM + Zeiss DSM 940 SEM + Zeiss EM 902 TEM</td>
<td>Electron Microscopy Laboratory</td>
</tr>
<tr>
<td>300 MHz Varian Mercury + 500 MHz Varian Unity-Inova</td>
<td>Nuclear Magnetic Resonance Laboratory</td>
</tr>
<tr>
<td>* 600 MHz Varian Unity-Inova for Liquids, with Cryo-probe</td>
<td></td>
</tr>
<tr>
<td>* 600 MHz Varian VarianS for Solids and Liquids</td>
<td></td>
</tr>
<tr>
<td>Lithography + Evaporation/Sputtering Deposition</td>
<td>Nanotechnology Laboratory</td>
</tr>
<tr>
<td>4000 Q TRAP™ LC/MS/MS System</td>
<td>Mass Spectroscopy Laboratory</td>
</tr>
<tr>
<td>PANalytical X’Pert PRO</td>
<td>X-Ray Diffraction Laboratory</td>
</tr>
</tbody>
</table>
In the Spotlight
Federica Raia / Associate Professor

The fundamental theme permeating Dr. Raia’s work emanates from her fascination with complex dynamic systems in both her original geoscience research field of magma dynamics and eruptive behaviors as well as in her more recent complementary research field of geoscience education. Both areas are integral parts of her vision of contemporary science in a world in which research and teaching are inexorably integrated into a cohesive whole: Science Education Research. Dr. Raia is developing a theoretical framework for studying and analyzing: 1) How we come to understand complexity, and the mechanisms underlying processes such as self-organization, adaptation, and emergence; 2) The role of causality in the context of understanding complex systems; 3) Integration of Emotion and Cognition in Learning science; 4) Define indicators to help Earth Science faculty assess students’ approach to complexity and understanding of Earth System Science Petrology/Volcanology. She spent her sabbatical year working at the US Geological Survey, Reston VA, investigating the petrological, geochemical and isotopic (Nd-Sr-Pb) composition variations of the southern Italian (Aeolian Islands & Campanian Province) volcanic rocks and their bearing on identifying crust and mantle reservoirs, and the possible links between reservoir composition and geodynamic processes. This work is done in collaboration with colleagues from the University of Naples (Italy) and the USGS.

Accomplishment:
Funding for developing 1) Integrated system of professional development for the Improvement of Science and Technology Teaching and Learning-NYS-DOE and 2) Center for Leadership in Urban Science Teaching, Evaluation, and Research ~NSF 3) Expanding The Environment of Engineering and Entrepreneurship Program at CCNY with funding by the National Oceanic and Atmospheric Administration.
Jim Rios / Graduate Student
After earning a BS degree in Earth and Atmospheric Science from City College, Jim joined the Hydro-Climate lab at City College to pursue a Master's degree in Atmospheric Science and Satellite Remote Sensing of Hurricanes with Prof. Z. Johnny Luo though the NOAA Crest center. He attended the 5th annual national NOAA-Educational Partnership Program conference in Washington D.C. where he won an award for his work with Prof. Luo. His research in the Hydro-Climate lab has also led to exciting field research opportunities. Recently, he was able to combine his mountaineering experience with his remote sensing studies on an expedition to study supraglacial lake dynamics on the Greenland ice sheet with Prof. Marco Tedesco. Jim plans to take his graduate Earth Science training to work on environmental sustainability and green initiatives in industry while continuing to explore wild places.

Joel Koplik / Professor
Dr. Koplik has been using numerical simulations to study a number of “microscopic” aspects of complex fluid flows. These calculations are all based on the known local interactions between the constituent atoms, molecules, solid particles, etc., and determine the behavior of heterogeneous systems at larger scales using a numerical method appropriate to the problem. Recent examples studied, ranging from the smallest constituents to the largest, include superfluid vortex tangles driven by turbulent flow, size separation of nano-sized particles in solution (a “nanofluid”) using flow through obstacle arrays or flow across surfaces with variable patterns of wettability, aggregate structure and pattern formation when the solvent of a nanofluid evaporates, and transport and jamming of subsurface fluids (often particulate suspensions) flowing through geological fractures.

For More Information:
http://lev.ccny.cuny.edu/jkcv.htm
Sean Cleary / Professor
Professor Cleary’s mathematical research ranges from the theoretical to the concrete. The underlying theme is mathematical group theory, which captures abstractly the essence of symmetry and geometric patterns. Results in group theory are often beautiful for their own sake but also have strong connections to applications across the sciences. His recent work has focused on the efficient use of binary tree data structures, which arise in a wide range of computational frameworks. His work includes joint projects with researchers around the world as well as with CCNY undergraduate and graduate students. His research is funded by the Computational Mathematics program at the National Science Foundation as well as through the Louis Stokes Alliance for Minority Participation and Research at the City University of New York.

For More Information:
http://www.sci.ccny.cuny.edu/~cleary
Camille Petit / Graduate Student

Camille Petit received her Masters degree in France in 2007. After a research project conducted in Professor Bandosz’s laboratory at CCNY, she decided to pursue her interests in Environmental Chemistry and enrolled in the Ph.D. program in Chemistry in Fall 2008. Her Ph.D. thesis focuses on the removal of ammonia (a pollutant) from air using carbon-based materials. Part of this research is directed toward the preparation of carbon based adsorbents combining high adsorption capacities and suitable characteristics for real-life applications. Another goal of the project is the identification of the features enhancing ammonia adsorption on the latter materials. The adsorbents tested include modified activated carbon, graphite oxide, metal-organic framework and graphene-based nanocomposites.

Zi Lu / Undergraduate Student

Zi graduated from CUNY Macaulay Honors College at the City College of New York with a Bachelor of Science Degree in Chemistry. During his four-year undergraduate study, he not only gained background knowledge in different fields of science, but he also developed an intimate interest in the fields of biochemistry and structural biology, as well as general biomedical sciences, under Dr. Yuying Gosser. Zi’s research mainly focused on a project in which he crystallized and solved the protein structure of Aspergillus Oryzae cutinase enzyme. This also led to a peer-reviewed paper published in the Journal of American Chemical Society in collaboration with Dr. Montclare from the Polytechnic Institute of NYU. This project furthered his interest in pursuing biomedical research. He has recently started his graduate studies at the Tri-institutional Training Program in Chemical Biology (TPCB) at Weill Cornell Medical School.
George John / Associate Professor

Professor John’s research has epitomized the notion of adopting green chemistry for developing sustainable technologies. His group has successfully demonstrated the efficient utilization of crop-based precursors (sugars, fatty acids and plant lipids) to develop molecular building blocks, green surfactants and polymers. They self-assemble into a unique set of soft materials such as molecular gels, responsive surfactants, delivery vehicles for drugs and pheromones, organic-inorganic hybrid films and an analytical tool for nanomolar Hg2+ detection. Such intriguing research has resulted in five original research articles and an invited feature review, all featured as cover page articles. The most notable was the development of an environmentally benign method to clean-up oil spills (Angew. Chem. Int. Ed., 2010, 49, 7695–7698). Biocatalytically derived sugar amphiphiles exhibited efficient gelation of crude oil and crude oil fractions from an oil-brine mixture. The oil spill recovery research team includes graduate student Swapnil Jadhav and several collaborators. The current clean-up technology offers multiple advantages such as total separation of oil from water bodies, recovery of the oil, and most importantly recyclability of amphiphiles. The eco-friendly alternative oil spill recovery technique has invited world-wide attention including Discovery News, C&EN News of the Week, highlights in Nature Materials and Nature Chemistry.

Accomplishments:

Stephanie Tardieu / Undergraduate Student
Stephanie began her long history of giving back following a visit to Haiti. There she saw children who roamed the streets unclothed and hungry. Upon her return to New York she created an organization to help those Haitian children that exists to this day.

Stephanie earned her French and International Baccalaureate degree from the French Lycee in New York and entered City College in spring 2006. She decided to become a physician as a result of many experiences throughout her life and the opportunities offered to her as a City College student. She graduated with honors in May 2010 and entered the Albert Einstein College School of Medicine in Fall, 2010.

Gustavo Hernandez / Undergraduate Student
Gustavo Hernandez came to this country from the Dominican Republic at age 10 and when he entered City College until he was awarded the Josh and Judy Weston Scholarship that allowed him to devote himself entirely to his studies.

With the help of the Weston, a community service based scholarship, he was able to found Hermano y Hermanito, a program which keeps children from the Williamsburg area of Brooklyn off the streets by providing them with after school activities and a nurturing environment. He also organized activities to raise funds for pediatric patients at Mt. Sinai Hospital and for Abraham House, a facility for children from dysfunctional families.

As a City College student, Gustavo quickly learned and assimilated scientific knowledge despite his lack of fluency in English, graduated Magna Cum Laude, and was admitted to the Albert Einstein School of Medicine in Fall, 2010.

His experiences at City as a participant in the Summer Undergraduate Mentoring Program at Einstein and his community activities have enabled him to develop himself intellectually and to become a competent and caring physician.
Morgan Billick / Graduate Student

Morgan came to CCNY as an undergraduate, biology major in 2005 as a transfer student from Florida and graduated with high honors in 2007. While still an undergraduate she explored research by working in the research lab of Distinguished Professor John J. Lee, investigating various aspects of marine microbiology, including chromosomal studies in various species of dinoflagellates. She went on to complete her Masters in Ecology and Evolutionary Biology under the supervision of Dr. Lee, examining the role of benthic foraminifera from Lizard Island off of the Great Barrier Reef, Australia. As a result of her proficiency in Electron Microscopy, Morgan then took on the challenge of assisting in the management of the Science Division EM facility under the supervision of the Facility Manager Jorge Morales. Morgan plans to continue her studies in coral reef ecology and conservation of marine environments of the tropics and subtropics.
Amy Berkov / Assistant Professor

The widening of the Panama Canal currently underway has created a rare opportunity to study the insects that inhabit the plants of environmentally sensitive rain forest habitats. Biology Professor Amy Berkov is leading a research effort that could shed new light on biodiversity by documenting the area’s host-plant relationships.

“If you want to study biodiversity and conservation, you need to know what animals eat and where they live, even when those animals are insects,” explains Professor Berkov. “For concealed feeders that spend their immature stages feeding within plant tissues, where they live and what they eat are the same…but the insects are not easy to find.”

“We’re trying to collect woody species — trees and vines — to find out what species of beetles inhabit these plants,” she said. Beetles spend their larval stages under the bark of the plants. To get the host-plant association, collecting adults from plant surfaces is not adequate because it does not tell us where the larvae live. But collecting larvae is also impractical because they are too difficult to identify. The only solution therefore is to rear adults from wood with intact bark, a protocol that Prof. Berkov has developed over many years of field research.

Preliminary results show that the first adult beetles in the Panama Canal emerged after only two months, which is a much faster rate than in Professor Berkov’s previous studies in French Guiana and Peru, where the first adults emerged after four to seven months.

Professor Berkov said further research would be needed to explain why the beetles emerged so quickly in this study.
Jermaine Lawson  /  
Undergraduate Student

Jermaine Lawson began his research career as a sophomore in Dr. Ross Nehm’s ecology lab and was a co-author on a chapter for a book entitled Evolutionary Stasis and Change in the Dominican Republic Neogene. He transferred to Dr. Tadmiri Venkatesh’s lab that studies neurodegeneration and during his first year in this lab he was named outstanding mentee of the year and then went on to receive the Sharon Cosloy scholarship and to co-author a paper. He was accepted into the NIH funded RISE program that he believes played a critical role in his decision to pursue a Ph.D in neuroscience. This program provided him with the means and resources to grow as a scientist. In the summer of 2008 he was awarded a fellowship to conduct research with Dr. Alberto Ferrus at the Ramon y Cajal Institute for Neuroscience in Madrid Spain. Following that experience he was recruited to the University of Graz in Austria for two months to further his neuroscience research. Jermaine is now in his first year of the Ph.D program in neuroscience at the University of Massachusetts Medical School.
Daniel Fimiarz / Research Facility Manager

Daniel has been working for the Office of the Dean since 2008. In 2009-2010 Daniel’s role has been focused on developing and improving information technology infrastructure of the division. Daniel is the maintainer and developer of multiple software solutions that are used to manage and supervise administrative and executive operations of the division. Notably, Science Division “Forum” (http://forum.sci.ccny.cuny.edu), an interactive and collaborative web portal, has become a very important tool allowing faculty/staff/students to share and access information improving overall communications capabilities of the division. The newest addition to forum, forumCURES (College Unified Request and Evaluation System), is an in-house implementation of a work order system that enables members of the division to submit requests directly to college facilities. Submissions are recorded in a database system and a tracking mechanism notifies every submitter about subsequent changes to their requests. The system also solicits and collects feedback from each submitter to allow accurate evaluation of work provided by each facility. In addition to Forum and forumCURES Daniel has also developed a scheduling system used by divisional Core Facilities, a billing and payment processing system, and a web based slideshow system. Daniel’s current project involves developing a unified database system to allow better storage and retrieval of information related to division faculty, their teaching, grants, and publications.
Learn More About Our Programs At

http://www1.ccny.cuny.edu/prospective/science

http://forum.sci.ccny.cuny.edu/

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