

# Program Faculty

Professor Morton M. Denn, The Benjamin Levich Institute for Physico-Chemical Hydrodynamics, City College of CUNY, 1-M Steinman Hall, New York, NY 10031, [denn@ccny.cuny.edu](mailto:denn@ccny.cuny.edu)

Professor Jeffrey T. Koberstein, Department of Chemical Engineering, Columbia University 812 S. W. Mudd, Mail Code 4721, New York, NY 10027, [jk1191@columbia.edu](mailto:jk1191@columbia.edu)

A list of participating faculty members follows. Other faculty at both institutions have active programs in soft materials and may serve as research mentors to IGERT students. In addition, both institutions offer courses in soft materials and related topics in addition to those that comprise the IGERT core.

## City College of New York

**Morton M. Denn**, Principal Investigator; Director, Benjamin Levich Institute for Physico-Chemical Hydrodynamics; Departments of Chemical Engineering and Physics. *Rheology, polymer blends, transport at interfaces.*

**Alexander Couzis**, Department of Chemical Engineering. *Polymer surfaces, self-assembled monolayers, interfacial transport.*

**Lane Gilchrist**, Department of Chemical Engineering, In Vitro Biomembrane Hybrid Systems.

**Joel Koplik**, Department of Physics. *Molecular simulation, transport in randomly disordered materials.*

**Iлона Kretzschmar**, Department of Chemical Engineering, *molecular and nanoparticle self assembly, chemical and material modification of nanoparticle surfaces, two- and three-dimensional nanoparticle assembly, vacuum technology, surface and material science.*

**Hernan Makse**, Department of Physics. *Granular materials, colloids, emulsions, glass transition, thermodynamics of nonequilibrium systems.*

**Charles Maldarelli**, Department of Chemical Engineering. *Interfacial phenomena, microfluidics.*

**Jeffrey Morris**, Department of Chemical Engineering, *suspensions, colloids, and multiphase fluid mechanics, with focus on the rheology and bulk flow*

**David S. Rumschitzki**, Department of Chemical Engineering. *Transport in biological tissue, two-fluid flows, mixing in microfluidic devices.*

**Mark Shattuck**, Department of Physics, *Granular materials, nonlinear dynamics, pattern formation and control.*

## Columbia University

**Jeffrey T. Koberstein**, co-Principal Investigator; Chair, Department of Chemical Engineering. *Polymer surfaces, thin films, biopolymers.*

**Christopher J. Durning**, Department of Chemical Engineering. *Thin film interfaces, polymer dynamics, dendrimers.*

**George William Flynn**, Departments of Chemistry and Chemical Engineering. *STM and AFM of large molecules on surfaces.*

**Sanat Kumar**, Department of Chemical Engineering. *Biochemical Engineering, Composite Materials, Interfacial Phenomena, Nanotechnology, Polymers*

**Rastislav Levicky**, Department of Chemical Engineering (currently at Polytechnic University) *DNA, biotechnology, nano-structured materials.*

**Ben O'Shaughnessy**, Department of Chemical Engineering. *Theory of polymer dynamics, reacting polymers.*

**Nina C. Shapley**, Department of Chemical Engineering. *Multiphase fluid mechanics, rheology.*

**Nicholas J. Turro**, Departments of Chemistry and Chemical Engineering. *Photochemistry, spectroscopy of complex fluids.*

Funding provided by:



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**NSF IGERT GRADUATE  
RESEARCH  
FELLOWSHIPS**

**FOR THE STUDY OF  
MULTISCALE PHENOMENA IN  
SOFT MATERIALS**



**City College of CUNY**

**and**

**Columbia University**

**In the City of New York**

<http://softmaterials-igert.org>

# Program Overview

City College of New York (CCNY), the Engineering and Science Flagship of the City University of New York, and Columbia University invite applicants for doctoral research fellowships for the study of **Multiscale Phenomena in Soft Materials**. This unique interdisciplinary Ph.D. program in soft materials is made possible by a National Science Foundation Integrated Graduate Education and Research Traineeship (IGERT) grant.

**Soft materials** are organic media that organize on supra-molecular length scales via weak associative interactions. Examples include thin polymeric films for sensors, organic blends for electronic displays, and natural and artificial tissue, spanning the range from complex fluids to soft solids. Soft materials are intrinsically multi-scale, from molecular to macroscopic, and interfaces play a vital role in properties and performance. A stunning variety of structures and morphologies can emerge, enabling a wide range of new technologies, and all scales impact processing and use.

Engineering and Science faculty members at City College and Columbia University, neighboring institutions in upper Manhattan, are active in teaching and research in the area of soft materials. We have combined our efforts to create a unique interdisciplinary program. Our vision is a PhD program in soft materials that will bring together students and faculty from the engineering and natural sciences, each reinforcing the core of the traditional discipline with an interdisciplinary coursework and research experience that encompasses the scope of today's problems in soft materials and provides the intellectual foundation for addressing the problems of the future.

The Ph.D. program is built around joint seminars, an industrial internship, collaborative thesis research, and a core of joint course offerings, including two laboratory courses. Each student will be registered in an appropriate academic department at CCNY or Columbia; the CCNY faculty are associated with the Benjamin Levich Institute for Physico-Chemical Hydrodynamics. The IGERT core, half of which will be taught on each campus, will be taken in addition to the core disciplinary requirements in the student's major department. The soft materials courses are consistent with the Ph.D. elective requirements of the participating academic departments. The central feature that is characteristic of all of the research programs is how multiple time and length scales in soft materials interact to determine the ultimate properties.

## The IGERT Program

IGERT Ph.D. Students will register in an engineering or science department at CCNY or Columbia and complete the usual requirements for the Ph.D. in that department. Students will also complete at least six soft materials courses, which may be selected from the following and from other courses that are offered on an occasional basis:

- Introduction to Soft Materials
- Molecular Simulation
- Rheology and Mechanics of Soft Materials
- Interfacial Chemistry of Soft Materials
- Interfacial Chemistry Laboratory
- Polymer Surfaces and Interfaces
- Soft Materials Characterization Laboratory

The soft materials courses will satisfy elective requirements for the Ph.D. in all participating departments.

IGERT students will also complete a twelve-week summer internship in an industrial laboratory, typically after the first full year in residence. Participating companies include Air Products, ATOFINA, Cabot, Dupont, ExxonMobil, Glaxo, and S. C. Johnson.

The program will include a regular student seminar, alternating between City College and Columbia, and a monthly Soft Materials Seminar Series with distinguished outside speakers. A "buddy" system for new students, pairing them with older graduate students, will facilitate adaptation to the new environment. Each senior graduate student will serve once as a Teaching Assistant for one of the soft materials courses. Annual meetings of the IGERT Advisory Committee will include posters by all students who are engaged in research related to the IGERT program.

Stipends for the first three semesters are determined by the established rate for National Science Foundation fellowships, which is currently \$30,000/year. Students also receive tuition and health insurance. IGERT fellowships are restricted to U.S. citizens and permanent residents, but financial support is available for a limited number of other qualified applicants. This program website is located at <http://softmaterials-igert.org> and for more information concerning the Levich Institute, City College and Columbia University, please visit:

Levich Institute: <http://www-levich.engr.ccnycunyu.edu>

CCNY: <http://www.ccnycunyu.edu>

Columbia: <http://www.chemecolumbia.edu>