Research and Development

The Graduate Program in Genetics was founded in 1980 as an inter-institutional program, combining the strengths in genetics at Stony Brook University, Cold Spring Harbor Laboratory, and Brookhaven National Laboratory. With nearly 100 faculty, the Genetics Program encompasses expertise that ranges from fundamental studies on classical animal, plant, and microbial model systems to cutting-edge research on behavior, cancer, and other human diseases. Students enjoy superb opportunities for training that reflect the ever-expanding role of genetics in modern biological and biomedical research. For instance, alongside traditional mutagenic screens with model organisms, the rapidly growing discipline of genomics is producing an explosion of information, which in turn is revealing the genetic circuitry of and relationships among all forms of life. Data gathered by both traditional and new methodologies underscore the central importance of genetics in delineating the connection among genes, their biological functions, and the evolutionary processes that shape life on earth. Genetics also gives practical insights into how defects in genes contribute to disease, as well as how gene products and genetic engineering can be used to improve the human condition.

The first-year student experience includes three core courses that establish a foundation for further study. In addition, each student rotates through three laboratories; these rotations furnish a basis for selecting a dissertation research advisor in May of the first year. All Genetics students further deepen their knowledge and experience by participating in a student seminar series, thematic journal clubs, and elective courses chosen from a wide array of offerings. The breadth of the Graduate Program in Genetics draws trainees from throughout the world with varied backgrounds and research interests, and the Program provides the options and flexibility to meet each student’s particular needs.

Admission Requirements of Genetics Program

The Graduate Program in Genetics requires the following in addition to the minimum Graduate School admission requirements:

A. Superior undergraduate performance, which should include some formal training in genetics.

B. Graduate Record Examination (GRE) General Test scores. Note that subject-specific tests (i.e., Biology) are not required, but are helpful when available.

C. Three letters of recommendation, ideally from previous research mentors and faculty.

The program does not require, but prefers to see, evidence of research activity as an undergraduate. Whenever possible, prospective students are invited to visit for interviews with program faculty.

D. Acceptance by the Graduate Program in Genetics and by the Graduate School.

All students accepted into the program receive full support in the form of a tuition scholarship, stipend and subsidized health insurance. The annual stipend for the 2014-2015 academic year is $27,680. Although future stipend increases cannot be guaranteed, it is reasonable to expect periodic increases. Students who remain in good standing with both the Genetics Program and the Graduate School receive full tuition scholarships, health insurance benefits and stipend support throughout their graduate careers.

Facilities of Genetics Program

The primary training facilities are Stony Brook University, Cold Spring Harbor Laboratory and Brookhaven National Laboratory. Program faculty at Stony Brook are drawn primarily from departments within the College of Arts and Sciences or the School of Medicine. The Life Sciences Building, which houses the Genetics Program office, is home of the Departments of Molecular Genetics and Microbiology, Biochemistry and Cell Biology, Neurobiology and Behavior, and Ecology and Evolution, all of which are represented in the Genetics Program. The University Health Sciences Center, located across the street from the Life Sciences Building, is the primary home for departments in the School of Medicine, including the Departments of Medicine, Pathology, Pharmacological Sciences and Physiology and Biophysics. In addition, the Program also includes faculty in the Departments of Applied Mathematics and Statistics, Biomedical Engineering, Psychology and others. The Centers for Molecular Medicine, a state-of-the-art research building adjacent to the Life Sciences Building, houses three interdepartmental thematic research centers: The Centers for Developmental Genetics, Infectious Diseases, and Structural Biology. Each of these Centers include Genetics Program faculty. The Centers for Molecular Medicine provide both an intellectual and a physical catalyst for facilitating interactions among Stony Brook scientists with common interest in these areas of modern biology, irrespective of their departmental affiliation.
Cold Spring Harbor Laboratory is a modern, world-renowned research institute that provides numerous unique opportunities for trainees. Although the faculty at Cold Spring Harbor are not organized into departments, there is internationally recognized strength in the areas of cancer biology, neurobiology, plant genetics, structural biology, and bioinformatics. The world-class facilities that are available at Brookhaven National Laboratory provide additional resources for trainees in the Genetics Program, including the National Synchrotron Light Source, one of the most unique instruments in the world for probing biological phenomena. Research faculty at Brookhaven have widely recognized programs in the molecular biology of microbial, plant and animal systems, and have a leading role in the fields of proteomics, structural biology and imaging.

Requirements for the Ph.D. Degree in Genetics

In addition to the requirements of the Graduate School, the following are required:

**A. Course Requirements**

1. Molecular Genetics (MCB 503)
2. Graduate Genetics (BGE 510)
3. Cell Biology (MCB 656)
4. Research Proposal Preparation (BGE 693)
5. Graduate Student Seminar in Genetics (BGE 531) must be taken each semester.
6. During their first year, Genetics students rotate in the laboratories of three or four different faculty members, with the goal of selecting a mentor and environment for their dissertation research. The specific laboratories are selected by students based on their interactions with individual faculty. Rotation selections must be approved by the Graduate Program Director.
7. Three semesters of Readings in Genetics (BGE 691) are required. These “Journal Clubs” are typically taken during the first and second years of study. Students select from thematic journal club topics that are organized each semester by faculty at the different institutions. This exercise provides important training in critical analysis of the literature while also allowing students to broaden their knowledge base on selected topics of interest.
8. Each student must take two or more elective courses, for a minimum total of 6 credits. Electives must be approved by the Program Director. Typically, these courses are in the biological sciences (e.g., Developmental Biology, MCB 657; Immunology, HBP 533; Microbiology, HBM 640; or Molecular Evolution, BEE 565), but courses may also be taken in other relevant areas (e.g., computer sciences, bioengineering).
9. Integrity in Science (GRD 500) is required of all Life Science graduate students. This half-semester course on ethics is typically taken in the Spring semester of the student's first year.
10. Requirements for any specific student, in addition to those enumerated above, that will be beneficial due to a student’s prior training and/or area of specialization will be determined by the program director and executive committee in conjunction with the student and appropriate advisory committee.
11. Students must attain a grade of B or better in each of BGE 510, MCB 503, and MCB 656, as well as an overall average of B (3.0) or better in their elective courses.

**B. Comprehensive (Preliminary) Qualifying Examination**

At the beginning of the fourth semester, students will take a comprehensive (preliminary) examination covering diverse areas of genetics which tests each student’s ability to read and interpret primary scientific literature.

**C. Dissertation Proposal Examination**

After successful completion of the comprehensive (preliminary) examination, the student prepares a written proposal for the dissertation research project. This proposal has the format of a grant application, including information on the background and significance of the project, a detailed research plan, and any preliminary results that the student has generated that indicate the feasibility of the project. This written proposal is orally defended before a dissertation proposal examination committee. This committee does not include the student’s thesis advisor, but is selected by the student in conjunction with his or her advisor and program director. The dissertation proposal defense should occur during the fifth semester of graduate study. Generally, the faculty who participate in a student’s proposal examination committee then join with the advisor to form the student’s dissertation advisory committee.

**D. Advancement to Candidacy**

After successful completion of all required and elective courses, the comprehensive (preliminary) examination, and the dissertation proposal examination, the student will be recommended to the Graduate School for advancement to candidacy. Each student must meet with his/her dissertation advisory committee at least once a year to inform the members of his/her progress and solicit the members’ advice.

**E. Ph.D. Dissertation**

The research for the Ph.D. dissertation is conducted under the supervision of the dissertation advisory committee. Upon approval of the completed dissertation by this committee, a formal public oral defense of the dissertation is scheduled, at which the student presents his or her findings and is questioned by members of the audience. Subsequently, the candidate defends the dissertation to the examining committee in a closed session.

**F. Teaching Requirement**
It is expected that each graduate student completing a doctoral degree will have functioned as a teaching assistant during at least two semesters of his or her graduate career (BIO 600).

G. Publication Requirement

To be eligible for graduation, each student must submit as first author at least one manuscript of original research to a suitable peer-reviewed journal (as determined by the Program’s Executive Committee). Moreover, the journal’s editors must deem the paper of sufficient quality to merit evaluation by external reviewers.

H. Residence Requirement

The University requires at least two consecutive semesters of full-time graduate study. The demands of the course of study necessitate a longer period of residence.

Faculty of Graduate Program in Genetics

Distinguished Professors

Benach, Jorge, Ph.D., 1971, Rutgers University: Pathogenesis of and host responses to spirochetal infections.

Citovsky, Vitaly, Ph.D., 1987, Hebrew University, Jerusalem: Nuclear transport and intercellular communication in plants.

Sterngranz, Rolf, Ph.D., 1967, Harvard University: Chromatin structure and function in yeast; histone modifying enzymes.

Wimmer, Eckard, Dr rer nat., 1962, Gottingen, Germany: RNA virus genetics, replication and pathogenicity; cellular virus receptors; whole viral genome synthesis; development of novel vaccines.

Professors

Bahou, Wadie, M.D., 1980, Massachusetts Medical Center: Human genetics; gene therapy; genetic disorders of hemostasis and thrombosis.

Bliska, James B., Ph.D., 1988, University of California, Berkeley: Molecular and cellular basis of bacterial-host cell interactions.


Carter, Carol A., Ph.D., 1972, Yale University: HIV and retroviral assembly and replication.

Del Poeta, Maurizio, M.D., 1992, University of Ancona, Italy: Role of sphingolipids in mediating signaling pathways and fungal pathogenesis.

Demple, Bruce, Ph.D., 1981, University of California, Berkeley: Mechanisms and roles of human enzymes that repair oxidative (free radical) damage in DNA.


Enikolopov, Grigori, Ph.D., 1978, Institute of Molecular Biology, Russian Academy of Sciences, Moscow: Stem cells; neurogenesis; imaging; signal transduction.

Frohman, Michael, M.D., Ph.D., 1985, University of Pennsylvania: Lipid signaling; vesicle trafficking and fusion; mitochondrial fusion; myogenesis.

Furie, Martha B., Ph.D., 1980, Rockefeller University: Interactions among endothelial cells, leukocytes, and pathogenic bacteria.

Futcher, A. Bruce, D.Phil., 1981, University of Oxford: Cell cycle control, microarrays, genomics.


Ghebrehiwet, Berhane, D.V.M./D.Sc., 1974, University of Paris, France: Role of complement C1q receptors during infection and inflammation.


Hollingsworth, Nancy, Ph.D., 1988, University of Washington, Seattle: Regulation of meiotic recombination in yeast.


Konopka, James, Ph.D., 1985, University of California, Los Angeles: G-protein coupled receptor signal transduction; fungal pathogenesis (Candida albicans).
Kritzer, Mary8, Ph.D., 1989, Yale University: Sex differences in cortical microcircuitry.

Lin, Richard Z.11, M.D., 1988, University of California, San Francisco: Physiology of phosphoinositide 3-kinase signaling.

Mackow, Erich R.7, Ph.D., 1984, Temple University: Viral regulation of cell signaling responses; hantavirus, influenza, dengue and rotavirus pathogenesis.

Marshall, Nancy Reich5, Ph.D., 1983, Stony Brook University: Signal transduction and activation of gene expression by cytokines; cellular defense responses to viral infection.

Moll, Ute9, M.D., 1985, University of Ulm, Germany: Tumor suppressor genes; role of p53 in human cancer.


Shroyer, Kenneth9, Ph.D. 1983, M.D. 1987, University of Colorado. Cancer biomarkers as diagnostic adjuncts in cervical pathology and cytopathology; cervical cancer and HPV.

Smith, Steven O.3, Ph.D., 1985, University of California, Berkeley: Structure and function of membrane proteins.

Thanassi, David7, Ph.D., 1995, University of California, Berkeley: Biogenesis of bacterial adhesion organelles.

Thomsen, Gerald3, Ph.D., 1988, Rockefeller University: Embryonic developmental mechanisms, regeneration, stem cells and the evolution of developmental processes.

Tsirka, Styliana-Anna10, Ph.D., 1989, Aristotleian University of Thessaloniki, Greece: Neuronal-microglial interactions in the physiology and pathology of the central nervous system.

White, Thomas11, Ph.D., 1994, Harvard Medical School: Gap junction functions defined by genetic diseases and gene knockouts.

Zong, Wei-Xing7, Ph.D., 1999, UMDNJ - Robert Wood Johnson Medical School: Molecular regulation of apoptotic and necrotic cell death.

Associate Professors

Bingham, Paul3, Ph.D., 1979, Harvard University: Regulation of differentiation; transposable elements; regulation of splicing.

Canli, Turhan12, Ph.D., 1993, Yale University: Biopsychology; neural and genetic basis of emotion and cognition.

Carpino, Nicholas7, Ph.D., 1997, Stony Brook University: Positive and negative regulation of T cell receptor signaling.

Chen, Jiang9, M.D., Ph.D., 1995, Henan Medical University, China; 2001, University of Heidelberg, Germany: Planar cell polarity and primary cilia in skin and hair follicle development and skin cancers.

Chung, Jun9, Ph.D., 1999, Washington University School of Medicine: Mechanisms of tumor cell invasion and metastasis.


Dubnau, Joshua1, Ph.D., 1995, Columbia University: Genetics of amyotrophic lateral sclerosis in flies and humans; genetic circuits underlying olfactory behavior in flies.

Ge, Shaoyu4, Ph.D., University of Science and Technology of China: Molecular mechanisms and function of new neurons in the brain.

Girman, Geoffrey D.9, Ph.D., 1999, University of Iowa: Cancer metabolism and transcriptional regulation.

Ju, Jingfang9, Ph.D., 1996, University of Southern California: The mechanism of translational control mediated by non-coding RNAs in cancer.

Karzai, Wali3, Ph.D., 1995, Johns Hopkins University: Structure and function of RNA-binding proteins and biochemical studies of the SmpB-SsrA quality control system.

Kernan, Maurice8, Ph.D., 1990, University of Wisconsin: Genetics of touch and hearing in Drosophila; ciliogenesis and ciliary signaling.

Krug, Laurie7, Ph.D., 2001, Emory University: Virus-host interactions during chronic gammaherpesvirus infection.

Leatherwood, Janet7, Ph.D., 1993, Johns Hopkins University: Cell cycle control of DNA replication.
Martinez, Luis A.³, Ph.D., 1998, University of Texas at Austin: Gain-of-function activity of mutant p53 oncogene.

Neiman, Aaron³, Ph.D., 1994, University of California, San Francisco: Vesicle trafficking and intracellular signaling in yeast.

Rest, Joshua S.⁴, Ph.D. 2004, University of Michigan: Regulatory evolution; protein network evolution; bioinformatics.

Sirotkin, Howard⁸, Ph.D., 1996, Albert Einstein College of Medicine: Specification and patterning of the neural plate; vertebrate developmental genetics.

Takemaru, Ken-Ichi¹⁰, Ph.D., Graduate University for Advanced Studies, Japan: Cell signaling and ciliogenesis in mammalian development, health, and disease.

True, John R.⁵, Ph.D., 1995, Duke University: Evolutionary and developmental genetics of color patterning in *Drosophila*.

van der Velden, Adrianus⁷, Ph.D., 2000, Oregon Health and Science University: The mammalian T cell response to *Salmonella enterica* serovar Typhimurium.

**Assistant Professors**

Acosta-Martinez, Maricedes¹¹, Ph.D., 2002, Albert Einstein College of Medicine: Neuroendocrine regulation of the reproductive axis; signal transduction pathways and metabolic control.

Aguirre, Adan¹⁰, Ph.D., 2002, Centro de Investigacion y de Estudios Avanzados IPN, Mexico: Endogenous NG2 progenitor cells as cell-based replacement for a variety of brain pathologies.

Chan, Chia-Hsin¹⁰, Ph.D., 2007, National Taiwan University: Molecular mechanisms of cancer development; cancer metabolism and stemness.

Czaplinski, Kevin¹, Ph.D., 1999, UMDNJ-Robert Wood Johnson Medical School: Post-transcriptional control of gene expression in the nervous system.

Henn, Brenna⁵, Ph.D., 2009, Stanford University: Human evolutionary genetics; population genetics; genomics.

Levy, Sasha³, Ph.D., 2005, University of California, Santa Barbara: Evolutionary dynamics; network dynamics; yeast genomics; high-throughput technology development.


MacCarthy, Thomas², Ph.D., 2005, University College London, United Kingdom: Computational immunology; evolutionary systems biology.

Martin, Benjamin L.³, Ph.D., 2005, University of California, Berkeley: Stem cell maintenance and differentiation; developmental mechanisms of cancer pathogenesis.

Matus, David Q.³, Ph.D., 2006, University of Hawaii: Evolutionary, cellular, and developmental approaches to studying nematode uterine-vulval morphogenesis.

Seeliger, Markus¹⁰, Ph.D., 2004, Cambridge University, United Kingdom: Molecular mechanisms of protein kinase and ubiquitin ligase signaling in cancer and aging.

Shelly, Maya⁸, Ph.D., 2004, Weizmann Institute of Science, Israel: Molecular mechanisms of embryonic brain development; axon regeneration; neurodegenerative disorders.

Sheridan, Brian⁷, Ph.D., 2008, University of Pittsburgh School of Medicine: Generation and maintenance of effector and memory T cells in intestinal tissues in response to bacterial pathogens.


Veeramah, Krishna⁵, Ph.D., 2008, University College London, United Kingdom: Evolutionary genomics.

**Research Faculty**

Luberto, Chiara¹¹, Ph.D., 1997, Catholic University of Rome: Sphingolipid metabolism and signaling.

Zachar, Zuzana³, Ph.D., 1992, Stony Brook University: Cancer chemotherapy and drug discovery.

**Adjunct Faculty at Cold Spring Harbor Laboratory**

Egeblad, Mikala, Associate Professor. Ph.D., 2000, University of Copenhagen and the Danish Cancer Society: Tumor microenvironment; intravital imaging; tumor-associated myeloid cells; breast cancer.

Hammell, Christopher, Associate Professor. Ph.D., 2002, Dartmouth Medical School: Genetic regulation of temporal development and the function of animal microRNAs.

Huang, Z. Josh, Professor. Ph.D., 1994, Brandeis University: Development and function of the GABAergic inhibitory circuitry in neocortex; developmental plasticity; neurogenomics; autism.


Joshua-Tor, Leemor, Professor. Ph.D., 1990, Weizmann Institute of Science: Structural biology; nucleic acid regulation; RNAi; molecular recognition; X-ray crystallography.


Lee, Je Hyuk, Assistant Professor. M.D., Ph.D., 2002, Tufts University: Functional genomics; spatial reconstruction of gene expression and cell lineage information; technology development.

Li, Bo, Associate Professor. Ph.D., 2003, The University of British Columbia: Neuroscience; glutamatergic synapse; synaptic plasticity; schizophrenia; depression; rodent models of psychiatric disorders.

Lyon, Gholson J., Assistant Professor. M.D., Ph.D., 2004, Weill Cornell Medical College, Rockefeller University: Amino-terminal acetylation of proteins; human genetics; neuropsychiatric diseases; whole genome sequencing.

Martienssen, Robert A., Professor. Ph.D., 1986, Cambridge University: Plant genetics; transposons; development; gene regulation; DNA methylation.

McCombie, W. Richard, Professor. Ph.D., 1982, University of Michigan: Human genetics; human genome variation; personal genomics; genetics of psychiatric disorders; genetics of cancer, computational molecular biology.

Mills, Alea A., Professor. Ph.D., 1997, University of California, Irvine: Cancer; development; aging; senescence; epigenetics; autism.

Schatz, Michael C., Adjunct Associate Professor. Ph.D., 2010, University of Maryland: High performance computing for DNA sequence alignment and assembly

Sheltzer, Jason, CSHL Fellow. Ph.D., 2015, Massachusetts Institute of Technology: Consequences of aneuploidy and gene dosage imbalances in development and cancer.

Siepel, Adam C., Professor. Ph.D., 2005, University of California, Santa Cruz: Computational biology; population genetics; molecular evolution; transcriptional regulation.

Sordella, Raffaella, Associate Professor. Ph.D., 1998, University of Turin, Italy: Molecular therapeutics; signal transduction.

Spector, David L., Professor. Ph.D., 1980, Rutgers University: Cell biology; gene expression; nuclear structure; microscopy; non-coding RNAs.

Stillman, Bruce W., Professor. Ph.D., 1979, Australian National University: Cancer; cell cycle; DNA replication; chromatin assembly; yeast genetics.

Tonks, Nicholas K., Professor. Ph.D., University of Dundee: Posttranslational modification; phosphorylation; phosphatases; signal transduction; protein structure and function.

Trotman, Lloyd C., Associate Professor. Ph.D., 2001, University of Zurich: Cancer modeling and treatment; senescence and tumor progression; cancer visualization; PTEN regulation.

Tuveson, David A., Professor. M.D., Ph.D., 1994, Johns Hopkins University: Pancreatic cancer; experimental therapeutics; diagnostics; mouse models; cancer genetics.

VanAelst, Linda, Professor. Ph.D., 1991, Catholic University of Leuven, Belgium: Signal transduction; Ras and Rho proteins; tumorigenesis; neuronal development and disorders.

Research Faculty at Brookhaven National Laboratory


Number of teaching, graduate, and research assistants, Fall 2016: 34

1) Department of Anesthesiology
2) Department of Applied Mathematics and Statistics
3) Department of Biochemistry and Cell Biology
4) Department of Biomedical Engineering
5) Department of Ecology and Evolution
6) Department of Medicine
7) Department of Molecular Genetics and Microbiology
8) Department of Neurobiology and Behavior
9) Department of Pathology
10) Department of Pharmacological Sciences
11) Department of Physiology and Biophysics
12) Department of Psychology

*NOTE: The course descriptions for this program can be found in the corresponding program PDF or at COURSE SEARCH.*