

Molecular Genetics and Microbiology (HBM)

Chair: Jorge Benach, Life Sciences Building Room 280, (631) 632-4225

Graduate Program Director: Janet Hearing, Life Sciences Building Room 250B, (631) 632-8778

Graduate Program Coordinator: Kathryn Bell, Life Sciences Building Room 130, (631) 632-8812

Degree awarded: Ph.D. in Molecular Genetics and Microbiology

Graduate study in Molecular Genetics and Microbiology offers a diversified course of study leading to the Ph.D. degree. The major areas of study are the basic mechanisms of viral and bacterial pathogenesis, cell growth, signal transduction, and the molecular mechanisms of cancer.

Studies are directed toward an understanding of cell biology, molecular genetics, and microbial pathogenesis and are designed to prepare a student to become an effective research scientist.

The student prepares for a program of study in consultation with an advisory committee composed of faculty members active in several research areas. A research advisor, selected by the student at the end of the first year of study, then joins the advisory committee. The individualized program aims to develop breadth of understanding in the basic disciplines through active participation in laboratory research, coursework, and seminars.

Facilities

The Department of Molecular Genetics and Microbiology occupies the second floor of the Life Sciences Building. Program faculty members' laboratories are also located on the first and second floors of the Centers for Molecular Medicine (CMM) and within other departments at Stony Brook University, Brookhaven National Laboratory, Cold Spring Harbor Laboratory, and the Feinstein Institute for Medical Research. Approximately 47,000 square feet of research space are available within the Department of Molecular Genetics and Microbiology. Each research laboratory is fully equipped and, in addition, the Department provides access to a variety of communal central facilities and services. These include a cell culture and hybridoma facility, microinjection facility, glassware washing and sterilization facility, analytical equipment lab, deconvolution microscopy facility, environmental rooms, darkrooms, and fermentor facility. Major items of equipment are organized into these central facilities, which are readily available to trainees. The

CMM, a new state-of-the-art research and teaching facility, serves as a physical and intellectual bridge between investigators in the adjacent Life Sciences Building and the nearby University Health Sciences Center. The Health Sciences Library and Barry S. Coller Learning Center, located in the Health Sciences Center, contains collections of biological and medical books and journals presently totaling 262,000 volumes, including more than 3,200 journal titles. In addition, the Health Sciences Library provides access to more than 2,300 full-text electronic journals. Other campus libraries include the Frank Melville Jr. Memorial Library.

Admission

Predocutorial trainees in Molecular Genetics and Microbiology are admitted to the Graduate School of Stony Brook University by application to the program. The final decision concerning admissions is made by the Dean of the Graduate School, and the candidate is officially notified by letter from the Dean's office. In addition to the minimum Graduate School requirements, the following are taken into account:

A. Undergraduate performance in science courses;

B. Percentile on the Graduate Record Examination (GRE) General Test;

C. Three letters of recommendation

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

All students who are accepted into the Molecular Genetics and Microbiology program are accepted with full support. The level of support for 2008-2009 is \$26,000 per calendar year plus full tuition scholarship. Health insurance is provided for all students.

Faculty

Professors

Benach, Jorge, *Acting Chair*, Ph.D., 1971, Rutgers University: Pathogenesis of spirochetal infections and their host responses.

Bliska, James B., Ph.D., 1987, University of California, Berkeley: Molecular and cellular basis of bacterial-host interactions.

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

Furie, Martha,¹ Ph.D., 1980, Rockefeller University: Interactions among endothelial cells, leukocytes, and pathogenic bacteria.

Futcher, Bruce, D.Phil., 1981, University of Oxford: Control of cell division in eukaryotic cells.

Hayman, Michael J., Ph.D., 1973, National Institute for Medical Research, England: Mechanism of transformation by retroviral oncogenes; erythroid differentiation.

Hearing, Patrick, Ph.D., 1980, Northwestern University: Viral molecular genetics; eukaryotic transcriptional regulation; gene therapy.

Katz, Eugene R., Ph.D., 1969, University of Cambridge, England: Developmental and genetic studies on *Dictyostelium discoideum*; the role of membrane sterols in cell growth and development.

Konopka, James B., Ph.D., 1985, University of California, Los Angeles: G-protein coupled receptor signal transduction; fungal pathogenesis (*Candida albicans*).

Marcu, Kenneth,² Ph.D., 1975, Stony Brook University: Immunoglobulin gene expression and recombination; regulation and mechanisms of action of the inhibitor of NF- κ B kinase (IKK) complex.

Reich, Nancy, Ph.D., 1983, Stony Brook University: Signaling switches in gene expression by hormones or viral infection.

Steigbigel, Roy,³ M.D., 1966, University of Rochester School of Medicine: Treatment of HIV infection.

Wimmer, Eckard, Ph.D., 1962, University of Göttingen, Germany: The molecular biology of poliovirus replication and the molecular basis of picornaviral pathogenesis.

Associate Professors

Hearing, Janet C., Ph.D., 1984, Stony Brook University: Molecular analysis of Epstein-Barr virus latent cycle DNA replication.

Leatherwood, Janet, Ph.D., 1993, Johns Hopkins University: Cell cycle control of DNA replication.

Mackow, Erich R., Ph.D., 1984, Temple University: Rotavirus and hantavirus pathogenesis.

Paul, Aniko, Ph.D., 1966, Stanford University: Biochemical and genetic studies of poliovirus replication.

Thanassi, David, Ph.D., 1995, University of California, Berkeley: Secretion of virulence factors by bacterial pathogens; pilus biogenesis by uropathogenic *E. coli*.

Assistant Professors

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

Chan, Edward,⁴ M.D., 1997, State University of New York, Buffalo: Growth factor receptors and cancer.

Crawford, Howard, Ph.D., 1993, University of Texas Southwestern Medical Center at Dallas: Pancreatic cancer.

Karzai, Wali,² Ph.D., 1995, Johns Hopkins University: Structure and function of RNA-binding proteins and biochemical studies of the SmpBSsrA quality control system.

Lee, Christopher,⁵ M.D., University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School: Cancer vaccine development.

Patel, Kopal N.,⁶ M.D., 1996, University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School: Genetic profiling in the progression of thyroid cancer.

van der Velden, Adrianus, Ph.D., 2000, Oregon Health and Science University: Salmonella pathogenesis.

Zong, Wei-Xing, Ph.D., 1999, University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School: Cell death in response to stress and chemotherapeutic agents.

Adjunct Faculty

Anderson, Carl W., *Geneticist*,⁷ Ph.D., 1970, Washington University: Cell cycle control and cellular response to DNA damage.

Dunn, John J., *Senior Microbiologist*,⁷ Ph.D., 1970, Rutgers University: Transcription, processing, and translation of RNA.

Hannon, Gregory, *Associate Professor*,⁸ Ph.D., 1992, Case Western Reserve University: Cellular proliferation control; double-stranded RNA-induced gene silencing.

Li, Huilin, *Biophysicist*,⁷ Ph.D., 1994, University of Sciences and Technology, China: Structural biology of macromolecular assemblies and membrane proteins by cryo-electron microscopy.

Steinberg, Bettie M., *Associate Professor*,⁹ Ph.D., 1976, Stony Brook University: Papilloma viruses; cell-virus interactions; viral transformation.

Stillman, Bruce W., *Professor*,⁸ Ph.D., 1979, Australian National University: Mechanism of eukaryotic DNA replication.

Tracey, Kevin J., *Professor*,⁹ M.D., 1983, Boston University School of Medicine: The cholinergic anti-inflammatory pathway.

Research Faculty

Bahou, Wadie, *Professor*,¹⁰ M.D., 1980, Massachusetts Medical Center: Human genetics; gene therapy.

Boon, Elizabeth, *Assistant Professor*,¹¹ Ph.D., 2002, California Institute of Technology: Biofilms.

Cutler, Christopher, *Associate Professor*,¹² D.D.S., Ph.D., 1986 and 1990, Emory University School of Medicine: Periodontal disease.

Dean, Neta, *Professor*,¹³ Ph.D., 1988, University of California, Los Angeles: Protein trafficking in yeast.

Freimuth, Paul, *Associate Biochemist*,⁷ Ph.D., 1980, Stanford University: Adenovirus reproduction; virus-cellular receptor binding.

Joshua-Torr, Leemor, *Associate Professor*,⁸ Ph.D., 1991, The Weizmann Institute, Israel: Structural biology and molecular recognition.

Kew, Richard, *Assistant Professor*,¹⁴ Ph.D., 1986, Stony Brook University: Leukocyte chemotaxis; inflammation; pulmonary immunopathology.

London, Erwin, *Professor*,¹³ Ph.D., 1979, Cornell University: Membrane protein folding and lipid interaction.

Lowe, Scott, *Professor*,⁸ Ph.D., 1994, Massachusetts Institute of Technology: Apoptosis; anticancer therapy resistance.

Luft, Benjamin, *Professor*,¹⁰ M.D., 1976, Albert Einstein Medical College: Pathobiology of *Borellia* and *Toxoplasma*.

Miller, Todd, *Professor*,¹⁵ Ph.D., 1988, Rockefeller University: Signal transduction by tyrosine kinases.

Moll, Ute, *Professor*,¹⁴ M.D., 1985, University of Ulm: Tumor suppressor genes; role of p53 in human cancer.

Neiman, Aaron, *Assistant Professor*,¹³ Ph.D., 1994, University of California, San Francisco: Vesicle trafficking and intracellular signaling in yeast.

Skowronski, Jacek, *Associate Professor*,⁸ Ph.D., 1981, Lodz University: HIV genes and signal transduction in T cells.

Spitzer, Eric, *Associate Professor*,¹⁰ M.D., Ph.D., 1985, Johns Hopkins University: Molecular biology of microbial pathogens.

Stenlund, Arne, *Associate Professor*,⁸ Ph.D., 1984, Uppsala University, Sweden: DNA replication of bovine papillomavirus.

Studier, F. William, *Professor*,⁷ Ph.D., 1963, Caltech: Genetics and physiology of bacteriophage T7; structural genomics.

Thomsen, Gerald, *Associate Professor*,¹³ Ph.D., 1988, Rockefeller University: Embryonic induction in *Xenopus*.

Tonge, Peter J., *Assistant Professor*,¹¹ Ph.D., 1986, University of Birmingham: Enzyme mechanisms and rational drug design.

Tonks, Nicholas, *Professor*,⁸ Ph.D., 1985, University of Dundee: Post-translational modification; phosphorylation and phosphatases.

Wigler, Michael, *Professor*,⁸ Ph.D., 1978, Columbia University: Signal transduction and growth control in eukaryotes.

Number of teaching, graduate, and research assistants, Fall 2007: 25

1) Joint appointment, Department of Pathology

2) Joint appointment, Department of Biochemistry and Cell Biology

3) Joint appointment, Department of Medicine

4) Joint appointment, Department of Pediatrics

5) Joint appointment, Department of Urology

6) Joint appointment, Department of Surgery

7) Brookhaven National Laboratory

8) Cold Spring Harbor Laboratory

9) The Feinstein Institute for Medical Research

10) Department of Medicine

11) Department of Chemistry

12) Department of Periodontics

13) Department of Biochemistry and Cell Biology

14) Department of Pathology

15) Department of Physiology and Biophysics

Degree Requirements Requirements for the Ph.D. Degree in Molecular Genetics and Microbiology

The predoctoral training program offers its students the opportunity to study questions in virology, bacteriology, immunology, biochemistry, and cell and developmental biology utilizing the experimental approaches of the molecular biologist and geneticist. Instruction and course planning involve faculty members from the Department of Molecular Genetics and Microbiology and selected members from the Departments of Biochemistry and Cell Biology, Medicine, Pathology, Physiology and Biophysics, and Pharmacology, and from three outside institutions, Cold Spring Harbor Laboratory, Brookhaven National Laboratory, and The Feinstein Institute for Medical Research. The general philosophy of the program is that a successful research career in the diverse and heterogeneous area of molecular biology requires a broadly based background, familiarity with at least all of the above areas, and a frame of mind that is receptive to new approaches.

The Department of Molecular Genetics and Microbiology has an active seminar program of outside speakers who present topics relevant to molecular genetics and microbiology, and there is a yearly retreat in which ongoing research in the Department and recent progress in the field are presented and discussed. This retreat is held early in the fall to introduce new students to the faculty, to other students, and to the

areas of ongoing research within the Department. The Department also presents a colloquium each fall on human diseases, with outstanding researchers from throughout the world presenting their current work on the selected topic. Students in the program are encouraged to attend all of these programs as part of their training.

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

A. Course Requirements

It is the policy of the Department of Molecular Genetics and Microbiology that a student must obtain a grade of B or higher in each course. Any course with a final grade below 3.0 must be retaken.

First Year

Fall

MCB 520 Graduate Biochemistry I

HBM 503 Molecular Genetics

HBM 509 Experimental Microbiology (laboratory rotations)

HBM 690 Microbiology Seminar

MCB 517 Biomembranes

BSB 515 Computational Methods in Biochemistry and Structural Biology

Spring

HBM 522 Biology of Cancer (offered in alternate years)

MCB 656 Cell Biology

HBM 510 Experimental Microbiology (laboratory rotations)*

HBM 690 Microbiology Seminar

HBM 692 Experimental Methods in Molecular Genetics and Microbiology

GRD 500 Integrity in Science

**Students rotate through three different laboratories over the course of their first year. At the end of that year, students must identify and enter the laboratory in which they will conduct their dissertation research.*

Second Year

Fall

HBM 640 Molecular Mechanisms of Microbial Pathogenesis

HBP 533 Immunology

HBM 599 Graduate Research

HBM 690 Microbiology Seminar

HBM 691 Readings in Microbiology Literature

Spring

HBM 522 Biology of Cancer (offered in alternate years)

HBM 599 Graduate Research

HBM 690 Microbiology Seminar

B. Qualifying Exam

After the successful completion of all required courses, the student must pass a written qualifying examination.

C. Dissertation Proposal Exam

Within 16 months of passing the qualifying exam, each student submits a written proposal of his or her dissertation research (similar to an NIH grant proposal) and orally defends the proposal before his or her dissertation committee shortly thereafter.

D. Advancement to Candidacy

After successfully completing of all required and elective courses, the written comprehensive exam, and the dissertation proposal exam, the student will be recommended to the Graduate School for advancement to candidacy.

E. Attendance and Participation in Student Seminar

Both before and after being advanced to candidacy, the student is expected to participate actively in the program's student seminar series.

F. Ph.D. Dissertation

The research for the Ph.D. dissertation is conducted under the supervision of the dissertation committee, which is appointed by the program and approved by the Dean of the Graduate School. 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 dissertation committee and other members of the audience. A closed oral examination before the dissertation committee follows the seminar.

G. Teaching Practicum

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 studies.

H. Publication Requirement

All students must be the first author of at least one publication of original research in order to graduate.

Courses

HBM 503 Molecular Genetics

Introduces the classical work and current developments in lower and higher genetic systems. Covers gene structure and regulation in prokaryotic and eukaryotic organisms, mutational analysis and mapping, transposable elements, and biological DNA transfer mechanisms. Bacteriophage as well as lower and higher eukaryotic systems are used to illustrate aspects of molecular genetic structure and function. This course is offered as both MCB 503 and HBM 503.

Prerequisite: Matriculation in graduate program or permission of instructor
Fall, 3 credits, ABCF grading

HBM 509 Experimental Molecular Genetics and Microbiology

An introduction to modern microbiological research. The selection of laboratories is made in consultation with the student's advisory committee. By taking part in ongoing projects the student will learn experimental procedures and techniques and become acquainted with research opportunities in the Department.

Prerequisites: Matriculation in a graduate program and permission of the graduate studies director and the lab director
Fall, 1-8 credits, S/U grading

HBM 510 Experimental Molecular Genetics and Microbiology

An introduction to modern microbiological research. The selection of laboratories is made in consultation with the student's advisory committee. By taking part in ongoing projects the student will learn experimental procedures and techniques and become acquainted with research opportunities in the Department.

Prerequisites: Matriculation in a graduate program and permission of the graduate studies director and the lab director
Spring, 1-8 credits, S/U grading

HBM 511 Introduction to Biophysical Chemistry

Introduces the chemical principles and techniques needed for the study of biological macromolecules. Topics to be covered include solution chemistry, chemical thermodynamics, binding and dissociation equilibrium, denaturation phenomena, spectroscopy, and hydrodynamics. This course is intended to prepare non-Chemistry majors for more advanced work in biophysics.

3 credits, ABCF grading
May be repeated for credit

HBM 522 Biology of Cancer

A short course with the emphasis on cancer as a disease of man. Lectures address human cancer as seen by the clinician and as basic research relates to human disease. This course provides students with a link between courses in cell and molecular biology and the

application of this basic information to tumor management.

Spring, even years, 1 credit, ABCF grading

HBM 531 Medical Microbiology

Information derived from molecular and experimental cellular biology is presented to provide a foundation for understanding the basic aspects of the growth, regulation, structure, and function of viruses and prokaryotic and eukaryotic cells. The properties of the infectious agents are correlated to human diseases caused by these agents. Laboratory experiments demonstrate basic techniques to identify and quantitate microorganisms.

Prerequisite: Permission of instructor; matriculation as a Stony Brook medical or dental student

Fall, 1-4 credits, ABCF grading

May be repeated for credit

HBM 599 Graduate Research in Molecular Genetics and Microbiology

Original investigations under faculty supervision.

Prerequisite: Permission of instructor

Fall and spring, 1-9 credits, ABCF grading

HBM 640 Molecular Mechanisms of Microbial Pathogenesis

This course covers the principles and molecular mechanisms of pathogenesis of a selected group of the best understood viral and bacterial pathogens. A major focus of the course relates to pathogen modification of host extracellular and intracellular signalling events, as well as pathogen-host interactions pertaining to the innate, humoral, and cellular responses to infection. The material is presented by invited lecturers who are leaders in their fields. This course is directed to graduate students, postdoctorate and medical fellows, and advanced medical students, who are contemplating careers in infectious disease research.

Prerequisite: HBM, BMO 503, and BMO 520 3 credits, ABCF grading

HBM 690 Molecular Genetics and Microbiology Seminar

A weekly meeting devoted to current work in the Department. Enrolled students present seminars each week throughout the term.

Prerequisite: Permission of instructor

Fall and spring, 1 credit, S/U grading

May be repeated up to ten times for credit

HBM 691 Readings in Molecular Genetics and Microbiology Literature

Readings in microbiology literature covering areas of molecular biology and genetics.

Prerequisite: Permission of instructor

Fall, 1 credits, ABCF grading

May be repeated for credit

HBM 692 Experimental Methods in Molecular Genetics and Microbiology

The goal of this course is to introduce students to the rationale underlying the wide array of new methods in biology, as well as to promote the critical analysis of scientific literature. Lectures will be given about various scientific methods and approaches, and jour-



nal articles relating to the concepts introduced will be assigned. A separate discussion section will be held to review and critique the articles, to be led by the students.

Prerequisite: Must be registered in the HBM Program

1 credit, ABCF grading

HBM 699 Dissertation Research On Campus

For the student who has been advanced to candidacy. Original research will be under the supervision of the thesis advisor and advisory committee.

Prerequisite: Advancement to candidacy

(G5); permission of thesis advisor; major portion of research must take place on SB campus, at Cold Spring Harbor, or at Brookhaven National Lab

Fall, spring, and summer, 1-9 credits,

S/U grading

May be repeated for credit

HBM 700 Dissertation Research Off Campus—Domestic

Prerequisites: Must be advanced to candidacy

(G5); major portion of research will take place off campus, but in the U.S. and/or U.S. provinces (Brookhaven National Lab and Cold Spring Harbor Lab are considered on campus); all international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor; matriculation in graduate program or permission of instructor

Fall, spring, and summer, 1-9 credits,

S/U grading

May be repeated for credit

HBM 701 Dissertation Research Off Campus—International

Prerequisites: Must be advanced to candidacy (G5); major portion of research will take place outside the U.S. and/or U.S. provinces; domestic students have the option of the health plan and may also enroll in MEDEX; international students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed; international students who are not in their home country are charged for the mandatory health insurance (if they are to be covered by another insurance plan, they must file a waiver by the second week of classes; the charge will only be removed if the other plan is deemed comparable); all international students must receive clearance from an International Advisor; matriculation in graduate program or permission of instructor

Fall, spring, and summer, 1-9 credits,

S/U grading

May be repeated for credit

HBM 800 Full-Time Summer Research

Full-time laboratory research projects supervised by staff members.

Prerequisites: Permission of instructor and full-time graduate student status

0 credit, S/U grading

May be repeated