

Molecular and Cellular Biology Department

Graduate Program Director

Rolf Sternglanz, Life Sciences Building 348 (631) 632-8565

Graduate Program Senior Staff Assistant

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Degree Awarded

Ph.D. in Molecular and Cellular Biology

Description of the Molecular and Cellular Biology Department

The Molecular and Cellular Biology (MCB) Graduate Program offers a multidisciplinary course of study leading to the Ph.D. degree. Diverse biological systems of study from plants to humans are pursued in MCB research laboratories. These systems are used to investigate a variety of biological topics including: Cancer, Infectious Disease, Gene Expression, Structural Biology, Neurobiology, DNA Replication, Development, Immune Response, Cell Cycle, Protein Trafficking, Signal Transduction, and Biological Membranes. The MCB Program provides students with the opportunity to select an academic program in one of three specializations: Molecular Biology and Biochemistry, Cellular and Developmental Biology, or Immunology and Pathology. The goal of this approach is to provide the student with the widest range of research possibilities.

During the first year students participate in several core courses that serve to build a scholastic foundation for further study. The core courses include Graduate Biochemistry, Molecular Genetics, and Cell Biology. In addition, students receive training to critically evaluate original research articles in a Journal Club/Readings course. Students can select an area of specialization at the time of enrollment or they can decide on a course of study during their first year. The program of study in Molecular Biology and Biochemistry includes Physical Biochemistry and any of a number of electives. Training stresses biochemical and structural approaches to solve biological problems. The program of study in Cellular and Developmental Biology includes a course in Developmental Biology and any of a number of electives. Emphasis is placed on the control mechanisms that define and regulate growing and developing systems. The program of study in Immunology and Pathology includes courses in Immunology and General Pathology. This area of specialization emphasizes the cellular and molecular basis of human disease to foster a bridge between basic and clinical research. Each of the specializations enhances knowledge within the field to ensure our graduates are well equipped for a successful career in research.

The MCB Program involves students in ongoing research projects as soon as they arrive on campus. During the first academic year, students train in four different research laboratories to help in choosing a mentor for thesis dissertation. The first laboratory training, or rotation, is usually at Stony Brook University, but subsequent rotations can be performed at Cold Spring Harbor Laboratory or Brookhaven National Laboratory. The MCB Program crosses departmental boundaries and institutions to offer the student thesis research training in nearly 100 different laboratories. A decision for a thesis advisor is generally made by the end of the first academic year and research studies will subsequently form the foundation of a Ph.D. thesis.

All students in the MCB Program gain experience and skills in teaching and oral presentation of their research studies. During two semesters students assist in teaching undergraduate laboratory or lecture courses. The teaching experience can include assistance in formulation/grading of examinations and individual tutoring sessions. In the third and subsequent years graduate students present their research progress to other students and faculty in a seminar forum. The student seminars are an opportunity to gain communication skills and to learn about ongoing research of other students in different laboratories. In addition to student seminars, a number of faculty from outside the institution are invited for weekly seminars. These are opportunities to meet visiting scientists who are leaders in their field and to learn of their latest findings.

In the second year of the MCB Program students take a comprehensive qualifying exam. Following successful performance, students focus on their thesis research. In the third year students prepare a written Ph.D. Thesis Proposal in consultation with their faculty thesis advisor. The proposal is defended orally before a proposal committee comprised of faculty selected by the student. Following successful defense of the proposal, the student advances to candidacy and the proposal committee along with the faculty advisor become the student's Ph.D. Thesis Committee. The Ph.D. Thesis Committee meets at least once a year with the student to assess progress and discuss research strategies.

For more information, visit www.sunysb.edu/biochem/mcb.

Admission requirements for the Molecular & Cellular Biology

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

- A. A bachelor's degree with the following minimal preparation: mathematics through one year of calculus, chemistry (including organic chemistry and laboratory), general physics, and one year of biology (including laboratory);
- B. A minimum grade point average of 3.0 (B) in undergraduate courses including science and mathematics courses;
- C. Letters from three previous instructors;
- D. A report of Graduate Record Examination (GRE) General Test scores;
- E. Acceptance by both the Graduate Program in Molecular and Cellular Biology and the Graduate School. In special cases, students not meeting requirements A and B may be admitted on a provisional basis. These students must act to remedy deficiencies within the first year according to the program's requirements.

Facilities of the Molecular and Cellular Biology Department

The Biological Sciences Division and Health Sciences Center are well equipped for work in developmental and cellular biology. Individual faculty laboratories and central services provide a full array of state-of-the-art equipment. These include the Flow Cytometry Facility, the Cell Culture and Hybridoma Facility, the Transgenic Mouse Facility, the University Microscopy Imaging Center, and the Center for Analysis and Synthesis of Macromolecules. The Health Sciences Library contains a comprehensive collection of biomedical journals and books and is complemented by the Melville Library on the main campus.

Requirements for the Molecular and Cellular Biology Department

A. Course Requirements

Biochemistry and Molecular Biology Specialization

1. *Molecular Genetics (MCB 503)*
2. Graduate Biochemistry (MCB 520)
3. Biomembranes (MCB 517)
4. Cell Biology (MCB 656)
5. Structural Biology and Spectroscopy (MCB 512)
6. One approved elective graduate course
7. Students in their first year also rotate in four laboratories with the goal of selecting an environment for their thesis research.
8. Participation in Journal Club (MCB 531, MCB 532); Student Seminars (MCB 603, MCB 604); Visiting Scientists Seminars (MCB 601, MCB 602)
9. Enrollment in the first year in Ethics (GRD 500)
10. Enrollment in the first semester in Computational Methods in Biochemistry and Structural Biology (BSB 515)

Cell and Developmental Biology Specialization

1. *Molecular Genetics (MCB 503)*
2. Graduate Biochemistry (MCB 520)
3. Biomembranes (MCB 517)
4. Cell Biology (MCB 656)
5. Developmental Biology (MCB 657)
6. One approved elective graduate course
7. Students in their first year also rotate in four laboratories with the goal of selecting an environment for their thesis research.
8. Participation in journal club (MCB 531/532); Student Seminars (MCB 603, MCB 604); Visiting Scientists Seminars (MCB 601, MCB 602)
9. Enrollment in the first year in Ethics (GRD 500)
10. Enrollment in the first semester in Computational Methods in Biochemistry and Structural Biology (BSB 515)

Immunology and Pathology Specialization

1. *Molecular Genetics (MCB 503)*
2. Graduate Biochemistry (MCB 520)
3. Biomembranes (MCB 517)
4. Cell Biology (MCB 656)
5. General Pathology (HBP 531)
6. Immunology (HBP 533)
7. Students in their first year also rotate in four laboratories with the goal of selecting an environment for their thesis research.
8. Participation in journal club (HBP 590); Student Seminars (MCB 603, MCB 604); Visiting Scientists Seminars (MCB 601, MCB 602)
9. Enrollment in the first year in Ethics (GRD 500)
10. Enrollment in the first semester in Computational Methods in Biochemistry and Structural Biology (BSB 515)

Students must achieve a B or better in all required courses and must maintain a B average in elective courses.

B. Qualifying Examination

At the beginning of the fourth semester, the student must pass a written qualifying examination.

C. Research Proposal

Following successful completion of the qualifying examination, the student writes a research proposal based on the probable area of the student's Ph.D. dissertation. The proposal is defended orally to a faculty examination committee that does not include the student's research advisor. The proposal examination normally takes place by the end of the fifth semester. After passing the proposal examination, the faculty committee and Ph.D. research advisor usually become the student's Ph.D. thesis committee and meet with the student at least once a year to follow his or her thesis progress.

D. Teaching Experience

All students are required to gain experience in teaching by assisting in laboratory sections, leading discussion sections, or helping to formulate and grade examination papers. The teaching experience may be in either undergraduate or graduate courses, and extends over a period of two semesters.

E. Advancement to Candidacy

When the above requirements have been satisfactorily completed, a recommendation for advancement to candidacy for the Ph.D. will be forwarded to the Graduate School.

F. Ph.D. Dissertation

During the second year, the student initiates a dissertation research project in the laboratory of a particular member of the program faculty. After the student has passed the proposition examination, a research committee is appointed to guide the dissertation research, and when the research nears completion, a dissertation examining committee is appointed by the dean of the Graduate School.

G. Dissertation Defense

The dissertation defense, which completes the requirements for the Ph.D., consists of a public seminar presentation of the dissertation work followed by an oral examination before the dissertation examining committee.

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 the Molecular and Cellular Biology Department

Distinguished Professors

Benach, Jorge L.², Ph.D., 1972, Rutgers University: Host response to bacterial infections.

Grollman, Arthur, P.⁴, M.D., 1959, John Hopkins University: DNA damage, mutagenesis and repair; chemical carcinogenesis

Lennarz, William, J.¹, Ph.D., 1959, University of Illinois: Biosynthesis and function of glycoproteins in cell-cell interactions.

Sternglanz, Rolf¹, Ph.D., 1967, Harvard University: Chromatin structure and function in yeast; histone modifying enzymes.

Wimmer, Eckard², Ph.D., 1962, University of Gottingen, Germany: RNA virus genetics, replication, and pathogenicity; cellular virus receptors; whole viral genome synthesis; development of novel vaccines.

Professors

Bingham, Paul M.¹, Ph.D., 1979, Harvard University: Genetic control of development and gene expression in animals.

Bogenhagen, Daniel F.⁴, M.D., 1977, Stanford University: Mitochondrial DNA; Mitochondrial proteomics.

Brown, Deborah¹, Ph.D., 1987, Stanford University: Cholesterol/sphingolipid-rich membrane domains; role in endocytosis.

Bynum, David R.¹, Ph.D., 1981 Dartmouth College: Director, Long Island Group Advancing Science Education, Stony Brook University.

Chen, Wen-Tien⁸, Ph.D., 1979, Yale University: Proteases and integrins in cancer invasion, metastasis, and angiogenesis.

Citovsky, Vitaly¹, Ph.D., 1987, Hebrew University, Israel: Nuclear targeting and intercellular communication in plants.

Dean, Neta¹, Ph.D., 1988, University of California, Los Angeles: Protein glycosylation, fungal cell wall biosynthesis; fungal pathogenesis.

Deutsch, Dale¹, Ph.D., 1972, Purdue University: Metabolism and uptake of the endocannabinoids (anandamide and 2-AG).

Frohman, Michael A.⁴, M.D./Ph.D., 1986, University of Pennsylvania: Mammalian signal transduction, development, vesicular trafficking, mitochondrial fusion diabetes.

- Furie, Martha⁵, Ph.D., 1980, Rockefeller University: Interactions among pathogenic bacteria, endothelium, and leukocytes.
- Futcher, Bruce², Ph.D., 1981 Oxford University; Cell cycle control, microarrays, genomics.
- Gergen, J. Peter¹, Ph.D., 1982, Brandeis University: Pattern information and the regulation of gene expression during *Drosophila* development.
- Ghebrehiwet, Berhane⁸, D.V.M./D.Sc., 1974, University of Paris, France: Biochemistry; Role of complement C1q receptors during infection and inflammation.
- Halegoua, Simon³, Ph.D., 1978, Stony Brook University: Control of the neuronal phenotype and survival by growth factors using biochemical, molecular and cell biological approaches.
- Haltiwanger, Robert¹, Ph.D., 1986, Duke University: Glycobiology; role of glycosylation in signal transduction and development.
- Hayman, Michael², Ph.D., 1973, Institute for Medical Research, England: Viral/cellular oncogenes; differentiation of erythroid cells.
- Hearing, Patrick², Ph.D., 1980, Northwestern University: Adenovirus-host cell interactions, adenovirus assembly and vectors for gene therapy.
- Hollingsworth, Nancy¹, Ph.D., 1988, University of Washington, Seattle: Regulation of meiotic recombination in yeast.
- Johnson, Roger A.⁶, Ph.D., 1968, University of Southern California, Los Angeles: Regulation of cell function by pro-nucleotide inhibitors of transmembrane signaling mechanisms.
- Katz, Eugene^{2, 14}, Ph.D., 1969, University of Cambridge, England: Genetics/development in cellular slime molds.
- Konopka, James², Ph.D., 1985 University of California, Los Angeles: Signal transduction, morphogenesis, and genetics of pathogenic fungi.
- Levine, Joel M.³, Ph.D., 1980, Washington University: Cell-surface molecules of the developing nervous system.
- Lin, Richard⁶, M.D., 1988, University of California, San Francisco: Physiology of phosphoinositide 3-kinase signaling
- London, Erwin¹, Ph.D., 1979, Cornell University: Membrane protein structure/translocation/folding. Structure and function of sphingolipid/cholesterol rafts in membranes.
- Mackow, Erich R.², Ph.D., 1984, Temple University: Viral regulation of cell signaling responses. Hantavirus, Influenza, Dengue and Rotavirus pathogenesis.
- Malbon, Craig C.⁴, Ph.D., 1976, Case Western Reserve University: Signal transduction and gene regulation in differentiation and development: Roles of G-proteins.
- Marcu, Kenneth B.¹, Ph.D., 1975, Stony Brook University: NF-kappaB kinase signaling in stress, immunity and cancer; mechanisms of action of AID in adaptive immune responses.
- McLaughlin, Stuart⁶, Ph.D., 1968, University of British Columbia, Canada: Calcium/phospholipid second messenger system.
- Miller, Todd W.⁶, Ph.D., 1989, Rockefeller University: The regulation and substrate specificity of tyrosine kinases.
- Moll, Ute M.⁵, M.D., 1985, Ulm, Germany: Function/regulation of the p53 gene family in apoptosis and cancer.
- Reich, Nancy L.², Ph.D., 1983, Stony Brook University: Signal transduction and gene expression in response to cytokines and virus.
- Scarlata, Suzanne⁶, Ph.D., 1984, University of Illinois: Structure/function studies of G proteins and effectors.
- Schechter, Nisson¹, Ph.D., 1971, Western Michigan University: Homeobox and filament proteins in neuronal differentiation, growth and regeneration.
- Shroyer, Kenneth⁵, Ph.D. 1983, M.D. 1987, University of Colorado. Cancer biomarkers as diagnostic adjuncts in cervical pathology and cytopathology; cervical cancer and HPV.
- Simon, Sanford R.^{1,5}, Ph.D., 1967, Rockefeller University: Proteinases and their inhibitors in invasiveness inflammation and tumor metastasis; Inhibition of bacterial metalloproteinases.
- Smith, Steven O.¹, Ph.D., 1985, University of California, Berkeley: Structure and function of membrane proteins.
- Steigbigel, Roy T.⁸, M.D., 1966, University of Rochester: Immune dysfunction induced by HIV infection.

Tonge, Peter J.⁴, Ph.D., 1986, University of Birmingham, England: Chemical biology and spectroscopy; Enzyme mechanisms, rational inhibitor design and antibacterial drug discovery; Fluorescent and light-activated proteins.

Tseng, Linda¹¹, Ph.D., 1968, University of North Dakota: Reproductive molecular endocrinology.

Van Nostrand, William E.¹⁷, Ph.D. 1985, University of California at Irvine: Molecular pathogenic mechanisms in cerebrovascular pathology of Alzheimer's disease and related disorders.

Wollmuth, Lonnie³, Ph.D., 1992 University of Washington: Molecular mechanisms regulating excitatory synaptic transmission in the brain.

Associate Professors

Berrios, Miguel⁴, Ph.D., 1983, Rockefeller University: Cell structure and function; the cell biology of DNA damage and repair.

Fleit, Howard B.⁵, Ph.D., 1980, New York University: Leukocyte Fc receptors; macrophage differentiation.

Ghazizadeh, Soosan¹⁰, Ph.D., 1994, Stony Brook University: Epithelial stem cell biology; skin bioengineering and gene therapy.

Holdener, Bernadette¹, Ph.D., 1990, University of Illinois: The role of protein folding and *O*-fucosylation during embryonic development and stem cell differentiation

Karzai, Wali¹, Ph.D. 1995, Johns Hopkins University: Post-transcriptional Regulation of Gene Expression Kernan, Maurice³, Ph.D., 1990, University of Wisconsin: Genetics of touch and hearing in *Drosophila*; ciliogenesis and ciliary signaling.

Kew, Richard R.⁵, Ph.D, 1986, Stony Brook University: Role of complement activation and leukocyte chemotaxis in inflammation.

Leatherwood, Janet², Ph.D., 1993, Johns Hopkins University: Cell-cycle control and DNA replication; fission yeast molecular biology.

Lyman, Harvard¹, Ph.D., 1960, Brandeis University: Photocontrol of chloroplast development.

McKinnon, David³, Ph.D., 1987, John Curtin School of Medical Research, Australia: Molecular physiology of sympathetic neurons and cardiac muscle.

Moriya, Masaaki⁴, Ph.D. 1981, Nagoya University, Japan: Cellular responses to DNA damage.

Neiman, Aaron¹, Ph.D., 1994, University of California, San Francisco: Vesicle trafficking and intracellular signaling in yeast.

Prives, Joav⁴, Ph.D., 1968, McGill University, Canada: Cytoskeletal membrane interactions in muscle cells.

Quitschke, Wolfgang⁷, Ph.D., 1983, Stony Brook University: Gene regulation of proteins associated with neurodegenerative diseases.

Rebecchi, Mario J.⁸, Ph.D., 1984, New York University: Phospholipases and signal transduction.

Schärer, Orlando D.^{4,9}, Ph.D., 1996, Harvard University: Chemistry and biology of DNA damage and repair.

Simmerling, Carlos⁹, Ph.D. 1994, University of Illinois at Chicago: Development of tools for efficient and simulation of chemical systems and using them to study the structure and dynamics of molecules involved in biological processes.

Sirotkin, Howard³, Ph.D., 1996, Albert Einstein College of Medicine: Vertebrate neural development and patterning.

Spector, Illan⁶, Ph.D., 1967, University of Paris, France: Neuronal differentiation and microfilaments.

Spitzer, Eric D.⁵, M.D./Ph.D., 1985, Johns Hopkins University: Molecular biology of *Cryptococcus neoformans*.

Thanassi, David G.², Ph.D., 1995 University of California at Berkeley: Virulence factors of pathogenic bacteria.

Thomsen, Gerald H.¹, Ph.D., 1988, Rockefeller University: Embryonic development mechanisms and their evolution.

Tsirka, Styliani-Anna⁴, Ph.D., 1989, University of Thessaloniki, Greece: Neuronal-microglial interactions in the physiology and pathology of the central nervous system.

Wang, Hsien-yu⁶, Ph.D., 1989, Stony Brook University: Wnt/Frizzled and G-protein signal transduction in development.

White, Thomas⁶, Ph.D., 1994, Harvard University: Molecular biology and physiology of gap junction channels.

Zieve, Gary⁵, Ph.D., 1977, Massachusetts Institute of Technology: Assembly/transport of snRNP particles.

Assistant Professors

Boon, Elizabeth M.⁹, Ph.D., 2003, California Institute of Technology: Nitric oxide signaling in bacteria.

Bowen, Mark⁶, Ph.D., 1998, University of Illinois, Chicago: Molecular recognition at the synapse.

Cao, Jian⁸, M.D., 1986, Zhengzhou University School of Medicine; M.S., 1992, Peking Union Medical College/Chinese Academy of Medical Sciences: Cancer invasion/metastasis and anti-cancer drug discovery.

Carrico, Isaac⁹, Ph.D., 2003, California Institute of Technology: Site-specific protein labeling; glycoproteins.

Chen, Emily⁴, Ph.D., 2002, University of California, San Diego: identifying determinants of breast cancer metastasis and mass spectrometry-based proteomics.

Colognato, Holly⁴, Ph.D., 2000, Rutgers University: Extracellular matrix in the brain; roles during development and during neurodegeneration.

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

Garcia-Diaz, Miguel⁴, Ph. D., 2003, UAM University (Madrid, Spain): DNA repair and mitochondrial gene expression.

Seeliger, Markus⁴, Ph.D., 2003, Cambridge University: Function and mechanism of protein kinases and ubiquitin ligases.

Takemaru, Ken-Ichi⁴, Ph.D., 1997, The Graduate University for Advanced Studies, Japan: Wnt signaling in development and disease.

Zong, Wei-Xing², Ph.D., 1999, University of Medicine & Dentistry of New Jersey: Molecular regulation of apoptotic and necrotic cell death.

Adjunct Faculty

Dunn, John, Microbiologist.¹³ Ph.D., 1970, Rutgers University: Structure/function of bacteriophage T7 RNA polymerase.

Hannon, Gregory, Professor.¹⁵ Ph.D., 1992, Case Western Reserve University: Genetics of growth in mammalian cells and dsRNA-induced gene silencing.

Joshua-Tor, Leemor, Professor.¹⁵ Ph.D., 1991, The Weizmann Institute of Science: Structural biology; X-ray crystallography; molecular recognition; nucleic acid regulation; RNAi.

Krainer, Adrian, Professor.¹⁵ Ph.D., 1986, Harvard University: mRNA splicing; gene expression; RNA-protein interaction.

Lazebnik, Yuri, Professor.¹⁵ Ph.D., 1986, St. Petersburg State University, Russia: Molecular mechanisms of apoptosis.

Lowe, Scott, Professor.¹⁵ Ph.D. Massachusetts Institute of Technology: Modulation of apoptosis; chemosensitivity; senescence by cancer genes.

Martienssen, Robert, Professor.¹⁵ Ph.D., Cambridge University: Plant genetics; transposons; development; gene regulation; DNA methylation.

Mills, Alea, A., Associate Professor.¹⁵ Ph.D., 1997 University of California: Cancer; development; aging; senescence; epigenetics.

Muthuswamy, Senthil, K., Assistant Professor¹⁵, Ph.D., 1995 McMaster University: Understanding cancer initiation using three-dimensional epithelial structures.

Setlow, Richard, Professor.^{1,13} Ph.D., 1947, Yale University: DNA damage and repair; carcinogenesis and mutagenesis in fish, light-induced malignant melanoma.

Spector, David L., Director of Research & Professor.¹⁵ Ph.D., 1980, Rutgers University: Spatial organization of gene expression.

Stenlund, Arne, Associate Professor.¹⁵ Ph.D., 1984, Uppsala University, Sweden: DNA replication of papillomaviruses.

Stillman, Bruce, President & Professor.¹⁵ Ph.D., 1979, Australian National University: DNA replication and chromatin assembly in human and yeast cells.

Studier, William, Professor.^{1,13} Ph.D., 1963, California Institute of Technology: Molecular genetics of phage T7: recombinant protein productions.

Tansey, William P., Professor.¹⁵ Ph.D., 1991, University of Sydney, Australia: Regulation of oncoprotein stability.

Tonks, Nicholas, Professor.¹⁵ Ph.D., 1985, University of Dundee, Scotland: Characterization of protein tyrosine phosphatases.

Van Aelst, Linda, Associate Professor.¹⁵ Ph.D., 1991, University of Leuven, Belgium: Role of ras in mammalian cell transformation.

Wigler, Michael, Professor.¹⁵ Ph.D., 1978, Columbia University: Genomics and cancer.

Number of teaching, graduate, and research assistantships, fall 2009-10: 98

- 1) Department of Biochemistry and Cell Biology
- 2) Department of Molecular Genetics and Microbiology
- 3) Department of Neurobiology and Behavior
- 4) Department of Pharmacological Sciences
- 5) Department of Pathology
- 6) Department of Physiology and Biophysics
- 7) Department of Psychiatry
- 8) Department of Medicine
- 9) Department of Chemistry
- 10) Department of Oral Biology and Pathology
- 11) Department of Obstetrics and Gynecology
- 12) Department of Anatomical Sciences
- 13) Brookhaven National Laboratory
- 14) Recipient of the State University Chancellor's Award for Excellence in Teaching, 1975
- 15) Cold Spring Harbor Laboratory
- 16) Department of Applied Math and Statistics
- 17) Department of Neurosurgery

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