

**GRADUATE PROGRAM
IN
MOLECULAR AND CELLULAR BIOLOGY**

SUNY DOWNSTATE MEDICAL CENTER
BROOKLYN, NEW YORK

FALL, 2001
(LAST REVISED: FEBRUARY 2012)

INTRODUCTION

The purpose of the Graduate Program in Molecular and Cellular Biology is to prepare and develop students for a scientific research career in the biomedical sciences. The program emphasizes laboratory research experience, and aims to provide students with skills required to become independent investigators. This includes exposure to research outside of SUNY Downstate through a seminar series and the opportunity to present one's research at public forums inside and outside the University. Formal lecture and journal discussion courses are offered during the first two years to provide training in modern research fields.

The first year of graduate studies consists of formal courses, discussion groups, seminars and laboratory research rotations. Students have the opportunity to choose two laboratories for 3-month rotations. By the end of the first year, most students commit to a laboratory and begin their thesis project. The decision to affiliate with a laboratory is an important one. To assist the students, the Graduate School organizes a series of lunchtime "Meet the Professor" seminars. There, they are introduced to the research interests of investigators who are in a position to mentor graduate students. Throughout their graduate studies students are required to participate in the MCB seminar series and the Work-In-Progress series. At the end of the first year, eligible students take the MCB qualifying exam.

The second year consists of advanced courses and thesis research. Students are encouraged to develop their thesis project and will be required to present their research in the Work-In-Progress series.

By the end of the third year students must defend their thesis proposal. The proposal, which is similar to an NIH grant application, focuses students on their thesis project, serves as a progress report, and functions as a foundation for the dissertation.

The Graduate School sponsors an annual Research Day at which students present a poster describing their research. Award winning posters receive travel funds for presenting their research at scientific conferences.

STRUCTURE OF THE PROGRAM

The graduate program consists of a group of research faculty and students who share broadly related interests in molecular and cellular biology. The Program is part of the School of Graduate Studies (Dr. Mark Stewart, Dean) and is subject to all Graduate School Policies. The faculty of the MCB Program, as of 2012, are listed in Appendix A. MCB Program policies are secondary, but concordant with, those of the Graduate School. The MCB Executive Committee decides MCB Program policies. This Committee consists of five persons, including the Program Director. In addition to policy-making decisions, the Committee oversees Program courses, student rotations, and the formation of thesis committees. It also deals with problems related to a student's academic performance.

Students are admitted to the Program through a competitive process. A Graduate School Committee composed of members from the MCB Program currently supervises admissions. A separate MD/Ph.D. committee considers medical students who wish to pursue a Ph.D. degree. Admission is decided by examination of an applicant's standardized test scores (GRE scores, for instance), undergraduate academic performance, scientific experience and letters of recommendation. In addition, the Committee considers an applicant's research interests and decides if they are appropriate to the Graduate Faculty.

CURRICULUM

The general philosophy of the Program is to encourage students to become engaged in a research project as soon as possible. For this reason, the required course work is minimal and is generally the same for each student. The required courses are Molecular and Cellular Biology I and II, Biochemistry, and Ethics. A statistics course is optional but may be required if statistical analysis of one's thesis project results requires it. Students must take two of the following advance courses: Cancer Biology, Proteomics & Genomics, Lipids and Molecular Mechanisms of Cardiovascular Disease, Molecular Genetics or MCB Advanced Tutorial. In order to graduate with a Ph.D. degree, a student must accumulate 48 credits.

A. Required Course Work

1. Core courses

Students are required to complete the MCB core curriculum, the Graduate School core curriculum and two advanced courses. In addition, students are required to attend the MCB Seminar Series and the MCB Work-In-Progress Series. A description of all the courses and a sample of the current standard curriculum are given in Appendix B. The courses are designed to give students a solid foundation in molecular, cellular and developmental biology, and in biochemistry. The lecture courses taught in the first year are MCBI, MCBII, Biochemistry, Ethics, and Statistics. During the second year, the students are strongly encouraged to satisfy the requirement of two advanced courses. These may not be formal lecture courses but often involve intense examination of important, current areas of research. Advanced courses generally require reading original papers and participation in discussion groups led by the course director or a guest speaker.

2. The MCB Seminar Series

The MCB Program arranges a seminar series, currently offered on Wednesdays. Prestigious speakers whose research interests are similar to those of the MCB Faculty are invited to speak. Attendance at seminars is mandatory and a professional commitment that every student must make during their tenure at SUNY. Students are encouraged to nominate and host speakers and to ask questions at the seminar. A

reception after the seminar provides an opportunity for the students to interact with the speaker and with other attendees.

3. Work-In-Progress and Annual Thesis Committee Meeting

Beginning with the second year, each student will give a Work-In-Progress seminar (research seminar) attended by his/her thesis committee, all MCB students (mandatory attendance), and other faculty. The seminars are meant to provide students with the opportunity to develop public speaking skills, prepare visual aids, receive constructive criticism, and gain experience in handling questions from an audience. Immediately after the seminar, the student and the committee meet privately. The main goals of the thesis committee meeting are to provide timely research advice and to evaluate student progress. In addition to the Work-In-Progress series, the Graduate School organizes a Graduate Research Day in the spring semester of each year. Starting in the second year, all graduate student members of the MCB Program present a poster describing their research at this school-wide event.

4. Laboratory Rotations

Students in the MCB Program are required to complete two rotations in the second semester of the first year of graduate studies. The purpose of the rotations is several fold. They provide students with an opportunity to examine the research interests of a particular laboratory in depth. This will help them make an informed choice of a research advisor and project. In addition, rotations offer students an opportunity to learn new techniques and areas of interest.

Since rotations qualify as a course, students must inform the Graduate School and the MCB Program Director of their choice of laboratories. With permission of the Program Director, further rotations may be arranged. The rotation schedule is:

Rotation 1. First week in January - Last week in March.

Rotation 2. First week in April - Last week in June.

Students arrange rotations by making an appointment with the desired faculty member(s) to discuss the possibility of a laboratory rotation. A list of MCB faculty is included in this manual. For some laboratories, it may be necessary to make arrangements during the first semester to assure a space in January or April.

You must officially register for two rotations. Usually, students register for one rotation each in the fall and the spring semester. Thus, registration for a rotation and the actual laboratory rotation times may not coincide. Following both rotations, students may decide to stay in one of the laboratories to do a thesis project. The Program strongly encourages students to commit to a thesis laboratory by the end of the first year.

B. Special Cases

1. Transfer Students.

It is the policy of the MCB program that students may be eligible to transfer credits from other Ph.D. programs within the United States. The courses must be substantially the same as the courses offered at SUNY Downstate. In addition, the courses must be current, which generally means that they have been taken within the past five years. Any student wishing transfer of credits must submit a copy of the previous course curriculum and an official transcript of grades. Only courses in which the student received a "B" or above will be considered for transfer. Within these general guidelines, members of the MCB Graduate Executive Committee will decide credit for previous courses on a case-by-case basis.

2. M.D.-Ph.D. Students.

It is the policy of the Graduate School that M.D.-Ph.D. students may transfer 24 credits from the first two years of their medical school curriculum. MD/PhD candidates are required to take MCBI, MCB2 and two of the five advanced courses offered by the program. MD/PhD students are also required to attend the MCB Seminar Series and the Work-In-Progress Series. Laboratory rotations, other than the summer research period between the first and second years of medical school, are not required. M.D.-Ph.D. students are expected to become formally affiliated with a research advisor at the time they enter the program. Thus, they will be subject to major deadlines (qualifying exams, thesis proposals) that apply to regular Ph.D. students who have matriculated the previous year.

EXAMINATIONS AND PRESENTATIONS

A. MCB Qualifying Examination

Introduction

The MCB qualifying exam has both a written and oral component. Students will write a five-page essay to formulate a scientific hypothesis. The hypothesis will be picked by lottery and will be on a topic not related to the student's current research. The thesis advisor is NOT permitted to review the essay. The chair of the examining committee is the student's prequalifying advisor who also is a member of the MCB Executive Committee. Each student is assigned a prequalifying advisor at Graduate Student Orientation upon entering the School. The prequalifying advisor will review the essay for readability and adherence to formatting requirements. The student is allowed one week to incorporate the prequalifying advisor's suggestions, if any, before the essay is distributed to the examining committee. The oral exam is a test of general knowledge of molecular and cellular biology. In addition, the committee will evaluate the student's ability to apply critical thinking to a research problem.

The approximate breakdown of the qualifying exam is 1) fundamental knowledge of molecular and cell biology (70%), 2) quality of the essay (15%), and reasoning ability (15%).

Schedule

Passing the qualifying exam certifies that a student is formally able to begin thesis research. A student is generally prepared for the exam when he or she has completed the first year curriculum and has found a faculty member willing to serve as thesis advisor. Students are required to take the qualifying exam by October 1 of the second year. If a student does not take the exam by this date, the MCB Executive Committee will choose an exam committee and an exam date no later than November 1 of the second year.

The qualifying exam schedule near the end of the first year is:

July 1	Topic assigned
August 1	Essay submitted to the prequalifying advisor and MCB Program Director
September 1-30	Exam

Examining Committee

The qualifying exam committee consists of three members. To maintain consistency and standards among all exam committees, the chairperson for the exam will be the prequalifying exam advisor who is a member (or a designee) of the MCB executive committee (Appendix C). At least one member of the examining committee should have expertise in the area related to the student's essay. The remaining member should complement the expertise of the other two members. As an aid to selecting the committee members, students are asked to provide a list of five persons. Include a short description of the expertise each person would bring to your proposed project. The prequalifying advisor will likely consult the list while determining the composition of the exam committee. As soon as three committee members are named, the student will contact each to arrange a date for the exam.

Exam

The committee members will grade the exam based on both the written and oral portions. As mentioned above the breakdown of the exam is 1) fundamental knowledge of molecular and cell biology (70%), 2) quality of the essay (15%), and reasoning ability (15%). The final grade is High Pass, Pass or Fail. Please note there are NO conditional pass grades, although the committee may suggest a student become more familiar with a particular topic. In the event of failure, students are allowed to retake the exam once. The retake must be scheduled within two months of the first exam.

A. The Essay

The written document is intended to benefit both the student and his/her committee members. It is meant to encourage the student to focus on the important aspects of a research proposal. Students will gain writing skills, develop a background reading list for the potential project and learn the standards for scientific writing. The essay may serve as a jumping off point for the oral portion of the exam and must be distributed to the committee usually 3-4 weeks before the exam. The essay requirement reflects the current expectation members of the scientific community have for students at this career stage.

The format is similar to actual predoctoral fellowships. The essay will be based on a topic NOT related to the thesis research project the student has undertaken or will undertake. The paper will follow the format described below. As discussed in other forums, most notably the ethics course, the paper must be written in the student's own words. To assist in preparation of the paper, it is advisable to refer to McMillan (2001). This short book describes a general approach for writing proposals and effective methods for avoiding the common problem of unintentional plagiarism. When completed, the essay is submitted to the prequalifying exam advisor who examines the essay for correct formatting. Upon receiving permission from the prequalifying exam mentor, the essay can be distributed to the other members of the examining committee.

- Format details: The paper length is restricted to five single-spaced or ten double-spaced pages in a minimum font size of 12 pts. Format references as in the journal *Cell*. Diagrams may be used to support, but not replace, word descriptions. These are included in the five-page single space maximum.
- Background information: Provide information pertinent to the hypothesis being proposed. The background enables the reader to understand your hypothesis and why it is important. It must be informative to readers who are not in that specific field. Point out gaps in knowledge your hypothesis might fill. Make reference to the current literature in your research area.
- State the Hypothesis to be tested
- Describe the Experimental Approach you will take and the Experimental System to be used. Do not dwell on experimental details. Explain why the chosen system is advantageous for your studies. Be sure to emphasize the scientific importance of the question and the approach.
- Discuss Potential Problems and Alternative Approaches you might take.
- References (not included in the five-page maximum).

B. The Oral

The chairperson of the examining committee may or may not ask for a brief presentation of your hypothesis and the proposed work. No overheads or slides are allowed but students are encouraged to use the white board. The presentation is limited to 10 minutes and illustrates the fact that a research investigator needs to be prepared to speak about his/her work extemporaneously. Thus, be aware that a 10-minute talk

needs careful preparation. Plan which topics you will need to discuss so that your hypothesis is understandable. Also, it is useful to design (and practice drawing) diagrams for the board. Useful suggestions for oral presentations can be found in McMillan (2001). Your presentation will be followed by a question and answer session. Questions will not be limited to the topic discussed in your essay.

To understand the nature and the scope of the exam questions realize that the goal of the exam is to assess your knowledge of molecular and cell biology, the content of the essay, and reasoning ability. The oral portion of the exam will generally last no more than two hours.

GUIDELINES FOR THE QUALIFYING EXAM

A. For Students

1. At orientation students joining the MCB program will receive a prequalifying advisor. This person will be a member (or designee) of the MCB executive committee, but cannot be the research advisor. The prequalifying advisor will function as chairperson of the student's qualifying exam committee.
2. On July 1 of the first year the qualifying exam begins with the research topic lottery. The topics are suggested by the MCB faculty.
3. After receiving the essay topic, the student may consult with his/her thesis research advisor to nominate 3-5 members of the MCB faculty as potential examiners. Include a brief description of the expertise/familiarity with the essay topic. The prequalifying advisor will review the nominations and decide on the composition of the 3-member examining committee.
4. Once the committee has been approved, invite each approved member to serve on the committee and arrange a date between September 1 and 30 and a location for the exam. Be sure to inform the Graduate School of the arrangements.
5. Submit your essay to the prequalifying advisor by August 1. The essay will be examined by the prequalifying advisor for conspicuous errors (too many figures; incorrect referencing etc.). Upon receiving permission from the prequalifying advisor, the student may distribute the essay to the rest of the committee.

B. For MCB Faculty

The goal of the MCB Qualifying Exam is to determine whether the student has sufficiently mastered graduate level molecular and cell biology. The exam will also probe the student's ability to write a cohesive fellowship application. And, the exam will probe the student's reasoning ability. The breakdown of the exam is 1) fundamental knowledge of molecular and cell biology (70%), 2) quality of the essay (15%), and 3) reasoning ability (15%). This framework will aid you in formulating exam questions.

With the exception of the Chair of the examining committee, no committee member may request revisions of the essay before the exam.

C. For the Chair of the MCB Qualifying Exam committee

1. Must be a member (or designee) of the MCB Executive Committee.
2. Functions as a contact person for the student.
3. Examines the essay before distribution to the committee members to determine if it meets certain minimal standards. These are:
 - a. No more than five single-spaced pages (or ten double). Fewer than five is fine if the essay is very well directed.
 - b. No more than one page containing a figure.
 - c. References in the text and listed.
 - d. General appearance (if you flip through the pages, is your eye drawn to typos and mistakes?)
4. Ensures consistency and fairness of the examinations.
5. Submits letter to graduate school with student's grade: High Pass, Pass, or Fail. Conditional pass grades are NOT permitted.

Thesis Proposal, Predefense, and Defense

Once a student passes the MCB Qualifying Exam and advances to candidacy for the Ph.D. degree, all examinations, including the thesis proposal, predefense, and defense, are governed by guidelines and rules published by the Graduate School. These guidelines and rules, which the student must become familiar with and subscribe to, are published in the Student Handbook.

Appendix A

FACULTY

Faculty Members of the MCB Program are listed below. This list is meant to assist you in deciding on a laboratory in which to do your rotations and, finally, your thesis project. A brief description of each faculty member's research interests is provided on the MCB web page. Please bear in mind that not all research investigators will have an opening in his or her laboratory for a graduate student. Rotations are offered for credit. Therefore, prior to initiating a rotation, you must have the consent of the laboratory director and register for each one of your rotations.

Babinska, Anna
Barbour, Randall
Batuman, Olcay
Bergold, Peter
Blain, Stacy
Boggiano, Cesar (IAVI)
Borer, Jeffrey
Boutjdir, Mohamed
Bowne, Wilbur
Brissette, Janice
Brunken, William
Carleton, Steve
Carty, Robert
Catanzaro, Dan
Chaqour, Brahim
Chirico, William
Chiuchiolo, Maria (IAVI)
Cramer, Eva
Dantias, John
Durkin, Helen
Feinman, Richard
Feuerman, Miriam
Fisher, Stanley
Friedman, Stanley
Gick, Greg
Hellen, Christopher
Hoffenberg, Simon (IAVI)
Hrabetova, Sabina
Hsu, Ellen
Huan, Chongmin
Hussain, Mahmood
Jiang, Xian-Cheng
Jurgens, Christy (IAVI)
Kass, Ira

Kollmar, Richard
Kral, John
Lange, Christopher
Lazar, Jason
Lee, Daniel
Lewis, John
Makowske, Mary
Marmur, Jonathan
Michl, Josef
Mills, Donald
Mokhtarian, Foroozan
Morrow, Gavin (IAVI)
Norin, Allen
Nowakowski, Maja
Ojakian, George
Parada, Camilo
Parks, Christopher (IAVI)
Patan, Sybill
Pestova, Tatyana
Pincus, Matthew
Quadros, Edward
Roman, Christopher
Rose, Arthur
Rushbrook, Julie
Sacktor, Todd
Saha, Subrata
Scalia, Frank
Siddiqui, M.A.Q.
Smith, Sheryl
Stracher, Alfred
Teitelman, Gladys
Tiedge, Henri
Vassalle, Mario
Vincent, Miriam
Volkert, Fredric
Wadgaonkar, Raj
Wagner, Michael
Zhang, Ming
Zhang, Xinsheng (IAVI)

Appendix B

COURSE DESCRIPTIONS AND DIRECTOR(S)

Molecular and Cellular Biology I

Stacy Blain

This course consists of a series of lectures taught by Program faculty with interests in Molecular Biology. The aims of the course are to develop an in-depth knowledge of prokaryotic and eukaryotic mechanisms regulating DNA, RNA and protein synthesis.

Molecular and Cellular Biology II

William Chirico

Molecular and Cellular Biology II aims to provide a background in the biology of the eukaryotic cell. Mechanisms regulating signal transduction pathways, the cell cycle and developmental decisions are discussed in the course.

Biochemistry

Mary Makowske

A graduate Biochemistry course is offered during the first year and covers the structure of proteins, enzyme kinetics and metabolism.

Statistics

Jay Weedon

The statistics course offers students an opportunity to learn commonly used statistical methods as applied to obtaining and reporting scientific data. In addition to lectures, students obtain hands-on computer experience for the statistical treatment of data.

Rotations

By arrangement

The MCB program requires students to complete two rotations before entering a laboratory to complete his/her PhD research. Each rotation is spent researching a specific problem using the techniques and expertise of that laboratory.

MCB Seminar Series (all years)

**Ed Quadros
Ming Zhang**

Work-In-Progress (all years)

**Stacy Blain
Brahim Chaqour**

Ethics

Alice Herb

The ethics course seeks to acquaint students with ethical and legal issues that guide the manner in which scientific research is conducted and reported.

ADVANCED COURSES

Thesis Research

Dissertation advisor

Cancer Biology

Stacy Blain

Lipids and Molecular Mechanisms of Cardiovascular Disease

Xian-Cheng Jiang

This is a team-taught course covering the following topics: 1) lipid metabolism and heart disease, 2) angiogenesis, 3) mechanism of cardiovascular disease, 4) metabolic syndromes, and 5) genetics of cardiovascular disease.

Proteomics and Genomics

Steve Carleton

Genomics and Proteomics (G518) introduces students to the history, basic concepts, and latest advances in genomics and proteomics. Topics include functional and comparative genomics, bioinformatics (database construction, pairwise matching, homology searches, gene prediction, genome browsers, multiple alignment, and publishing), DNA chips and gene expression, microbial and small eukaryotic genomics and proteomics, the human genome project (including human genomics and proteomics), structural proteomics, protein crystallization, analytical methods and applications, functional and chemical proteomics, and future technologies (including metagenomics, systems biology, new DNA sequencing technologies, high throughput SNP analysis, and protein chips).

Molecular Genetics

Camilo Parada

This course will acquaint students with molecular mechanism used by single cell organisms for signal transduction, cell cycle control, transcription and DNA synthesis.

Virology

Christopher Hellen

In this course, students read and discuss original research papers. A common theme in all the papers is mechanisms used by viruses to regulate gene expression.

Advanced Molecular & Cellular Biology Tutorial (Advanced MCB Tutorial).

By arrangement

MCB students choose an MCB faculty member to serve as the tutor. The tutor may not be the student's thesis advisor. Together they choose a topic that the student will study in depth during the course. The tutor will assign a final letter grade that may be based on a 45 minute PowerPoint presentation by the student on the chosen topic. The exact structure of a tutorial will depend on the tutor and student. The syllabus for an Advance MCB Tutorial requires prior approval by the MCB Program Director.

Advanced courses under consideration

Developmental Biology
Protein Structure
Immunology

Gladys Teitelman
Julie Rushbrook
Josef Michl
Christopher Roman

STANDARD CURRICULUM

YEAR 1

FALL SEMESTER

NUMBER	COURSE
G-203	Graduate Biochemistry
GI-201	Molecular Cellular Biology I
GI-201A	MCB Seminar Series
***	MCB Work-In-Progress

SPRING SEMESTER

GI-120	Graduate Statistics (Optional)
GI-500	Ethics in Research
GI-202	Molecular Cellular Biology II
GI-201A	MCB Seminar Series
***	MCB Work-In-Progress
G108	ROTATION 1 (Jan-Mar)
G108	ROTATION 2 (April-June)

YEAR 2

FALL SEMESTER

NUMBER	COURSE
GI-201A	MCB Seminar Series
G-***	MCB Work-in-Progress
G-999	Thesis Research

ADVANCED COURSE (SEMESTER AS OFFERED)

G-113	Virology
G-512	Developmental Biology
	Protein Structure
G-510	Immunology
G-113	Molecular Genetics

SPRING SEMESTER

GI-201A	MCB Seminar Series	(1)
G-***	Work-in-Progress	(1)
G-999	Thesis Research	

Appendix C

MCB GRADUATE EXECUTIVE COMMITTEE

William J. Chirico, Director
Chris Hellen
Xian-Cheng Jiang
John Lewis
Chris Roman
Brahim Chaqour