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GRADUATE PROGRAM IN MOLECULAR AND CELLULAR BIOLOGY

SUNY-HSC
BROOKLYN, NEW YORK

Fall, 2001

(revised, 12/15/09)

INTRODUCTION

The purpose of the Graduate Program in Molecular and Cellular Biology is to train 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 laboratories outside SUNY, Brooklyn through a seminar series as well as presentations of one's research at public forums within the University and at recognized meetings. Formal lecture and journal discussion courses are offered during the first two years to provide training in modern research fields.

The first year of training consists of formal coursework, discussion groups, seminars and laboratory work. Students will have the opportunity to choose two laboratories for a brief rotation project. As early as the end of the first year, most students will be prepared to make a commitment to a laboratory to begin a thesis project. The decision to affiliate with a laboratory is an important one. To assist you, the Graduate School organizes a series of lunchtime "Meet the Professor" seminars. There, you will be introduced to the research interests of investigators who are in a position to train graduate students.

The second year consists of formal coursework, some of which may be in the form of discussion groups. Students are encouraged to develop their thesis project and will be asked to present their research yearly in a seminar series known as "work-in-progress". A qualifying examination is given at the end of the second year. Upon successful completion of the qualifying examination, students are ready to devote most of their time to their thesis research project.

At around the end of the third year, students present a formal thesis proposal. The proposal, which is similar to an NIH grant application is meant to focus a student on his or her thesis project and serves as a progress report of productivity. It also functions as a preliminary document to the thesis.

As mentioned above, the program organizes a yearly seminar series of prestigious scientists working in fields related to the research interests of members of the MCB program. Attendance at the talks is required during all years in which you are associated with the University. The Graduate School sponsors an annual Research Day at which students present a poster describing their research. Award winning posters are funded for presentation at a Scientific Conference.

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. Susan Schwartz-Giblin, Dean) and is subject to all Graduate School Policies. The faculty of the MCB Program, as of 1999, 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 both the MCB Program and the Neurobiology 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), 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.

There are two kinds of faculty members in the program: (1) Members, who participate in all aspects of the Program, including teaching and supervision of thesis research; and (2) Associate Members, who do not serve as thesis advisors but may be involved in other aspects of Graduate education, such as teaching, service on thesis committees and rotations.

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. At the present time, required courses are Molecular and Cellular Biology I and II Current topics in Molecular and Cellular Biology I and II; Biochemistry; 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: Developmental Biology; Virology; Proteomics; Molecular

Genetics or Immunology. In order to graduate with a Ph.D. degree, you must accumulate 48 credits.

A. Required Course Work

Presently, you are required to complete the MCB Core curriculum, the Graduate School core curriculum and two advanced courses. A description of all the courses and a sample of the current standard curriculum is given in Appendix B. The courses are designed to give students a general background in Molecular, Cellular and Developmental Biology; as well as in Biochemistry. The current lecture courses taught in the first year are MCBI, MCBII, ethics, Statistics and Biochemistry. During the second year, two of the five advanced courses offered are required. 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.

B. 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 a professional commitment that every student must make during their tenure at SUNY. Students are encouraged to participate in the series in several ways. For instance, each student will be responsible for operating the slide projector and other general operating procedures that are needed for a seminar presentation. In addition, a reception is given following the talk so that students may interact with the speaker and with other persons who have attended the seminar.

C. Laboratory research

In the second semester of your first year, you will complete two (or more, if necessary) research rotations in the laboratory of a research investigator who is a member of the MCB program. The purpose of the rotations is many fold. First, they will help you to make an informed choice of the laboratory in which you do your thesis research. In addition, rotations offer students the opportunity to learn new techniques and areas of interest. Since rotations qualify as a course, you must inform the Graduate School and the MCB Program director of your choice.

D. Work-in-progress and annual thesis committee meeting

Beginning with the second year, each student will give a research seminar attended by his/her thesis committee, all MCB students, and other faculty. The seminars are meant to provide students with the opportunity to develop public speaking skills. Work-in-progress seminars also help students to learn how to prepare visual materials needed for public presentations. Immediately after the seminar, the student and the committee will meet in private. The main goals of the thesis committee meeting is to provide timely reseach advice and to evaluate student progress. In addition to work-in-progress, 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 will present a poster describing their work to be presented at this school-wide event.

E. Special Cases

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, Brooklyn. 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.

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 participate in research seminar and work-in-progress courses. 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.

ROTATIONS

Students in the Molecular and Cellular Biology Program are expected to complete two rotations as part of their course requirements. The purpose of these is to provide students with an opportunity to examine the research interests of a particular laboratory in depth. This will help you make an informed choice of a research advisor and project. Rotations also teach students techniques with which they are unfamiliar.

Students in the MCB Program must do two rotations according to the following schedule. If you wish, further rotations may be arranged.

Rotation 1. First week in January - Last week in March.
Rotation 2. First week in April - Last week in June.

To arrange a rotation, make an appointment with the faculty member(s) with whom you are interested in rotating. A list of MCB faculty is included in this brochure. For some laboratories, it may be necessary to make arrangements early in the semester to assure yourself a space in January or April.
You must officially register for two rotations. Usually, this is accomplished by registering for one rotation each in the fall and the spring semester. Note that 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. Alternatively, other rotations may be arranged. It is advisable that students become affiliated with a laboratory for thesis research by the second 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 MCB executive committee mentor will review the essay for readability and adherence to formatting requirements. The student is allowed one week to incorporate the mentor'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.

Timing

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 Executive Committee Mentor
September 1-30	Exam

The 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 a member (or a designee) of the MCB executive committee (Appendix C). The other two faculty members should have expertise in a research area related to the student's essay. 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. Members of the MCB executive committee will likely utilize the list to determine the composition of the oral exam committee. As soon as three

committee members are named, the student will contact each to arrange a date for the examination.

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 will also function as a jumping off point for the oral portion of the exam and will be presented to the committee usually 3-4 weeks prior to 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 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)[1]. 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 to be distributed to the chairperson of the examining committee (a member of the MCB executive committee). He/she will examine it briefly to determine if it is in the correct format (for instance, not too long, contains correctly formatted references, etc.). The document can then be distributed to all members of the 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*. Do not present data from your experiments unless crucial to your hypothesis. A critical evaluation of the Data presentation is limited to ONE page. However, the use of diagrams to support, but not replace, word descriptions is encouraged. 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.

[1] [1]McMillan, V.E. (2001). Writing Papers in the Biological Sciences. 3nd ed. Boston: Bedford/St. Martin's. 207p.

Explain why the system you intend to use 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).

The Oral:

The chairperson 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. Attached, you will useful suggestions from McMillan (2001) for oral presentations. Your presentation will be followed by a question and answer session. Questions will not be limited to the topic discussed in your essay. The essay is intended to be a learning experience and an indicator of the scientific field with which you are most experienced.

To understand the nature and the scope of the questions that may be asked of you, you must first realize the goal of the exam. It is meant to probe your general scientific knowledge, analytical skills and ability to formulate ideas. The test is not necessarily an accumulation of facts, but a familiarity with topics covered in courses, research seminars and in the scientific literature. The last point is especially important. Reading original scientific papers with the goal of understanding the experimental design and analyzing the results is one key to success.

The oral portion of the exam will generally last no more than two hours. The committee members will grade the exam based on both the oral and written portion. The grades are High Pass, Pass and 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 have a maximum of two months to reschedule a second examination.

GUIDELINES FOR THE QUALIFYING EXAM

For Students

1. At orientation students joining the MCB program will receive a program advisor. This person will be a member (or designee) of the MCB executive committee and cannot be the research advisor. The program 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 suggested by the MCB faculty. In consultation with your research advisor, give the program advisor a list of five faculty members with

research interests similar to yours. Include a brief description of the expertise each person might bring to the proposed project.
3. The MCB graduate executive committee will assign your committee members – three in all.
4. Contact each member and arrange a date (and a place) for the oral portion of the exam. Be sure to inform the graduate school of the arrangements.
5. Submit your essay to your program advisor by August 1. The essay will be examined for conspicuous errors (too many figures; incorrect referencing etc). Assuming there are none, distribute to the rest of the committee.

For MCB Faculty

One goal of the MCB program is to decrease the number of years taken to obtain a Ph.D. degree. The intent is to help our graduates become competitive in today's market and to allow time during the post-doctoral years to examine scientific career choices outside of academia. Attention to time deadlines will also stretch the resources of the graduate school and of individual investigators. We have streamlined the number of courses required (more on this later), developed a method for tracking each student and imposed a schedule for finishing the qualifying examination. It is to be taken at the end of the first year.

Conflicting time demands of the faculty also contribute to the lateness of the exam. The current format is a short written paper (five pages) and a two-hour oral examination. We hope this process will not be onerous and that faculty will be able to make qualifying exams a scheduling priority.

The MCB graduate executive committee will set up the examining committee for each student. Students have been asked to provide a list of five faculty with expertise in the topic of the student's research. This list should be generated with input from the research advisor. The presence of a student's research advisor during the oral exam is not permitted!

In a preceding section of this memo, the goals of the oral test are described. These provide a framework for the oral and will aid you in formulating questions when you serve on an examination committee.

For the Chairperson of the Qualifying exam committee:

- Will be a member (or designee) of the MCB graduate executive committee.
- Functions as a contact person for the student.
- Examines the essay prior to distribution to the committee members to determine if it meets certain minimal standards. These are:
  - No more than five single-spaced pages (or ten double). Fewer than five is fine if the essay is very well directed.
  - No more than one page containing a figure.
  - References in the text and listed.

    - General appearance (if you flip through the pages, is your eye drawn to typos and mistakes?)
- Ensures consistency and fairness of the examinations.
- Submits letter to graduate school with student's grade: High Pass, Pass, Fail.

Once students advance to candidacy for the Ph.D. degree, all examinations, up to and including, the thesis defense are governed by guidelines published by the Graduate School. The following outlines those but students must become familiar with, and subscribe to, the rules published in the Student Handbook.

B. Thesis Proposal

Briefly, a formal thesis proposal should be presented prior to the end of the student's third year in the School of Graduate Studies. The thesis proposal consists of a written document and a public oral presentation. Rules for this examination are determined by the Graduate School and are detailed in the Student Handbook. The written proposal should conform to the structure required by the National Insitutes of Health for a grant proposal.
The student will summarize his/her proposal in a public forum. The thesis committee consists of four members. Two of the members are from departments other than that of the research advisor. All members of the committee are expected to be present at the proposal meeting. The committee reads and critiques the written proposal. Following the oral presentation, the student, members of the thesis committee and the student's research advisor meet in a private session to determine if a passing grade has been obtained.

C. Thesis Predefense and Defense

The thesis committee consists of five members. Ideally, the chairperson for these examinations will be the same person who served on your qualifying and proposal examinations. That person will function to track your progress throughout graduate school and will not necessarily be an expert in the field of your dissertation. Other members of your thesis committee are meant to function as "experts in the field". In the event that a student and/or advisor wish to replace the chairperson, a member of the MCB graduate executive committee will be selected to serve as an additional member of the committee.

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. For your convenience, office room numbers for each member are provided. Any person listed below may also be contacted through the CC mail system. A brief description of each faculty member's research interests is provided on the following pages. Please bear in mind that not all research investigators will have an opening in his or her laboratory for a graduate student. Either the Graduate School or a member of the MCB Executive Program can provide you with this information. 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 (see the rotation form provided in Appendix C).

Altura, Bella	Rm 5-29
Altura, Burton	Rm 5-08
Barbour, Randall	Rm 4-133
Bard, Enzo	Rm 4-113
Batuman, Olcay	Rm 6-518
Begleiter, Henry	Rm 5-316
Bergold, Peter	Rm 6-78
Bernd, Paulette	Rm 2-36
Borukhov, Sergei	Rm 3-27
Boutjdir, Mohamed	VA Hospital
Carleton, Steven	Rm
Carty, Robert	Rm 7-94
Chirico, William	Rm 2-78
Cinelli, Angel	Rm 2-78
Cramer, Eva	Rm 2-87
Durkin, Helen	Rm 4-14
El-Sherif, Nabil	
Feinman, Richard	Rm 7-20
Feuerman, Miriam	Rm 3-83
Fisher, Stanley	Rm
Gick, Gregory	Rm 7-86
Gintzler, Alan	Rm 7-101
Hielscher, Andreas	Rm
Hellen, Christopher	Rm 3-98
Kornecki, Elizabeth	Rm 2-023
Lange, Christopher	Rm 7-046
Laurent, Brehon	Rm 3-020
Lewis, John	Rm 2-095
Makowske, Mary	Rm 7-103
McAllister, William	Rm 3-50
McLeod, Maureen	Rm 3-72
Michl, Josef	Rm 4-125
Miles, Kathryn	Rm 2-090
Mills, Donald	Rm 3-099
Norin, Allen	Rm AL-517
Nowakowski, Maja	Rm 4-109
Ojakian, George	Rm 2-084
Quadros, Ed	Rm
Roman, Christopher	Rm 3-50
Rothenberg, Sheldon	Rm 5-312
Rushbrook, Julie	Rm 7-015
Sacktor, Tod	Rm 6-87
Scalia, Franklin	Rm 2-015
Siddiqui, MAQ	Rm 2-005
Spielholz, Charles	Rm
Stracher, Alfred	Rm 7-005
Teitelman, Gladys	Rm 2-094
Tiedge, Henri	Rm 6-005
Vassalle, Mario	Rm 5-020
Volkert, Fredric	Rm 3-124
Wagner, Michael	Rm 2-005
Wang, Dalton	RM 7-88E

Appendix B
COURSE DESCRIPTIONS

Molecular and Cellular Biology I — Miriam Feuerman, Brehon Laurent

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 procaryotic and eucaryotic 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 eucaryotic 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 — Jack Lubowski, Matthew Avitable

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 — Ed Quadros, Ming Zhang

Ethics — ***Susan Schwartz-Giblin***, 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

Ph.D research.

Developmental Biology — Gladys Teitelman

This lecture course deals with classical methods of studying developmental Biology in eucaryotes.

Protein Structure — Julie Rushbrook

(Not yet offered)

Immunology — Josef Michl
Christopher Roman

Molecular Genetics — Donald Mills

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.

Current Topics in Proteomics and Genomics — Steve Carleton

New course as of Sept 2000. Information to follow

STANDARD CURRICULUM

YEAR 1

FALL SEMESTER

NUMBER	COURSE
G-203	Graduate Biochemistry
GI-201	Molecular Cellular Biology I/Topics
GI-201A	MCB Seminar Series

SPRING SEMESTER

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

YEAR 2

FALL SEMESTER

NUMBER	COURSE
GI-201A	MCB Seminar Series
G-***	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	

COURSE DIRECTORS

Course Title:	Course Directors
Molecular and Cellular Biology I	Chris Roman Camilo Parada
Topics in MCBI	Miriam Feurman
Molecular and Cellular Biology II	William Chirico
Biochemistry	Mary Makowske
Statistics	Jack Lubowski
Rotations	By arrangement
MCB seminar series	Ed Quadros Ming Zhang
Ethics	to be announced

Second Year:

Virology	Christopher Hellen
Immunology	Josef Michl
Molecular Genetics	Don Mills
Developmental Biology	Gladys Teitelman
Protein Biochemistry	Julie Rushbrook
MCB seminar series	Ed Quadros Ming Zhang

Appendix C

MCB GRADUATE EXECUTIVE COMMITTEE

William J. Chirico, Director
Mahmood Hussain
Xian-Cheng Jiang
John Lewis
Chris Roman