

UNIVERSITY OF ROCHESTER
SCHOOL OF MEDICINE AND DENTISTRY

Graduate Studies in

BIOPHYSICS AND STRUCTURAL BIOLOGY

Student Handbook

August, 2009

Mark Dumont, Program Director
David Mathews Chair, Education Committee
Rose Burgholzer, Graduate Studies Administrator

PREFACE

The Biophysics and Structural Biology Faculty (BSB) administers the Ph.D. degree program in Biophysics for the Department of Biochemistry and Biophysics. This handbook is intended to outline the major features and policies of the program. The general features of the graduate experience at the University of Rochester are summarized in the Graduate Bulletin, which is updated every two years. Students and advisors will need to consult both sources, though it is our intent to provide the salient features here. Policy, of course, continues to evolve in response to the changing needs of the graduate programs and the students in them. Thus, it is wise to verify any crucial decisions with the *Graduate Studies Administrator*.

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I. DEFINITIONS

Biophysics and Structural Biology (BSB) Program Director (Mark Dumont) leads the activities of the program.

Education and Curriculum Committee of BSB Program (David Mathews, Chair) is responsible for monitoring student progress through the educational program, and for curriculum development.

Graduate Studies Director (Mark Dumont) directs the Biophysics Ph.D. training program, provides advice to students on policies and various aspects of the program, and is responsible for communicating requirements and policies to the students.

Thesis Advisor selected at end of first year of study, is primarily responsible for directing student's research toward Ph.D.

Thesis Advisory Committee selected at beginning of second year of study, is responsible for monitoring student progress toward the Ph.D. degree and providing advice and consent with regard to the student's thesis research objectives.

Graduate Studies Administrator (Rose Burgholzer) keeps graduate student records and handles all questions regarding requirements and procedures.

The Department of Biochemistry and Biophysics office is located in room 3-8529.

II. BIOPHYSICS CURRICULUM

A. Courses

The curriculum consists of several components: the core course requirements, the general seminar requirements, and elective courses. The goal is to provide a curriculum that is balanced in breadth and depth. The breadth is provided by the core course requirements. The depth is provided by elective courses chosen by the student in consultation with his/her advisor. Some elective courses are listed below; however, the list is by no means exhaustive. The School requires an academic load of 16 hours per semester.

1. *Core Curriculum*

Fall Semester 2009

IND 408	Advanced Biochemistry	5 credits ⁱ
IND 409	Cell Biology	4
BPH 592	Special Topics in Molecular Biology ⁱⁱ	1
IND 501	Ethics in Research	1
BPH 571	Biophysics Seminar	1
BPH 595	Ph.D. Research (Rotation) ⁱⁱⁱ	
Total		16 credits

Spring Semester 2010

IND 410	Molecular Biology & Genetics ^{iv}	4 credits
BPH 411	Structural Biophysics	5
BPH 572	Biophysics Seminar	1
BPH 595	Ph.D. Research (Rotations)	6
Total		16 credits

ⁱ If a student is not prepared to take this course, please consult with advisor during the drop/add period.

ⁱⁱ Offered for students requiring remedial training in molecular biology in preparation for IND 410 (Spring)

ⁱⁱⁱ Credit hours to be determined dependent on other courses taken in this semester.

^{iv} BIO 402 may be substituted. This course is offered in the Fall semester and should be taken in the second year of studies.

Subsequent Semesters

BPH 509 Molecular Biophysics (5 credits)

BPH 567 Proposal Writing (1 credit)

BPH 571, 572 Biophysics Seminars (1 credit) [taken each semester]

Elective course(s) – consult with advisor

2. *Elective Courses*

A total of at least 24 graduate course credit hours (IND 408, 409, 410, BPH 411, 509, 567) must be accumulated before taking the Qualifying Examination. Any graduate course offered by the University of Rochester may be used as an elective provided it is appropriate to your program and is approved by the advisor. Some courses that commonly provide needed background for biophysics students are listed below; however, this list is by no means exhaustive and the student is advised to check the availability of courses in any given year or years because course offerings may change. See Appendix for course descriptions.

Partial list of possible electives

Fall Semester Courses (credit hours)

BIO 402 Molecular Biology (4)
BPH 402 Math Methods of Physiology & Medicine (3)
BPH 403 Mathematics for Molecular Biophysics (3)
BPH 408 Mathematical Methods of Biophysics (4)
CHM 414 Bioinorganic Chemistry (4)
CHM 422 NMR Spectroscopy (2)
CHM 451 Quantum Chemistry (4)
CHM 437 Bioorganic Chemistry (4)
CHM 470 Computational Chemistry (4)
MBI 473 Immunology (3)
NSC 512 Cellular Neuroscience (6)
PHP 403 Cell and Molecular Physiology (3)

Spring Semester Courses (credit hours)

BCH 412 Advanced Topics in Biological Macromolecules (5)
BCH 570 Chromatin & Transcription in Higher Eukaryotes (2)
BME 442 Cell Motility and Molecular Machines (2)
CHM 451 Quantum Chemistry (4)
BPH 513 Advanced Topics in Structural Biomolecular Diffraction and Scattering (2)
IND 443 Eukaryotic Genome Organization and Expression (4)
IND 447 Signal Transduction (4)

B. Suggested Progress Toward the Ph. D. in Biophysics

First Year

- Fall Semester: Course work as indicated, one laboratory rotation
- Spring Semester: Course work as indicated, two laboratory rotations
- End of May: Choose paper for first year exam
- Middle of June: Take first year preliminary exam
- Middle of June: Choose laboratory and begin Ph.D. research

Second Year

Fall Semester

- No later than September 30, submit a list of proposed members of Thesis Advisory Committee to the Department Office for approval
- Write thesis proposal outline and meet with Thesis Advisor to discuss it
- Take required course(s), elective(s), plus research credit

Spring Semester

- Take BPH 567, Proposal Writing
- Complete course work and finish required courses (BPH 411 or BPH 509)
- Present first Student Seminar
- Meet with Thesis Advisory Committee for first Research Review
- Prepare for Qualifying Examination

Note: Students generally complete the Teaching Assistantship (TA) assignment in the second year of studies (see III F).

Third Year

- Qualifying Examination should be taken by November 1 (see IV)

Note: Students entering the program with an M.S. degree are encouraged to accelerate their examination program.

C. Other Educational Opportunities

1. Departmental Seminars

The Department of Biochemistry and Biophysics as well as other departments in the School of Medicine and in The College sponsor seminar series' with outside speakers. While not considered formal courses for which credit is granted, these seminars are an important part of the graduate experience. Every effort should be made to attend.

2. Colloquium

The Colloquium on Biomolecular Structure is run by the BSB faculty. The Director of the Colloquium is Ben Miller. While it is supported by University funds and participation is University wide, its center of gravity is in the Program. The talks are on work at a formative stage, formal lectures are discouraged and discussion is encouraged. All students interested in biophysical analysis of the structure and function of biologically relevant molecules are invited to attend. The colloquium meets at noon on the third Friday of every month. Pizza is provided.

3. BSB Program Retreat - (Bi-annual)

The BSB program holds a bi-annual retreat using a Gordon Conference format. It is a one-day event, starting with breakfast, including lunch, and ending before dinner. Speakers are senior graduate students, postdoctoral fellows, and faculty. A poster session is also included and students are encouraged to participate. All graduate students are invited and expected to attend.

D. Exemptions from Course Requirements

Entering students who wish exemptions from core courses may request that the Director of Graduate Studies arrange an exemption interview to determine whether an exemption is appropriate. The exemption interview consists of a 30-60 minute discussion with the course director who will ask questions based on the content of the course under consideration. The course director will then advise the student, the student's advisor(s) and the Graduate Studies Director, whether or not the course needs to be taken.

Requests for exemption for BPH 567 (Proposal Writing) will be reviewed by the Education Committee. The critique written for the First Year Preliminary Exam, if high enough in quality, is one means of exemption and that decision rests on the recommendation by the chair of the exam. If the student has written a research proposal previously, that proposal may be submitted for review by the Education Committee as a basis of exemption.

E. Minimum Course Performance

If a student in the program receives one grade of "C" or below, he/she will be reviewed by the Program faculty. A recommendation will be made to the dean that may include termination from the program. If the student is allowed to remain in the program, the course or an appropriate substitute course, must be re-taken successfully with a final grade of B- or higher.

Students encountering difficulties in coursework should seek the advice of the course director and/or faculty advisor as early as possible. Personal tutoring by advanced graduate students can be arranged by the Graduate Studies Administrator.

F. M.D./Ph.D. Students

Students in the M.D./Ph.D. program who are considering a Ph.D. in Biophysics are encouraged to meet with the Biophysics Program Director and potential thesis mentors as early as is convenient but no later than the middle of the second year of the M.D. program.

Curriculum:

All M.D./Ph.D. students in the Biophysics program must complete the following courses:

BPH 411	Methods in Structural Biology	5 credits
BPH 509	Molecular Biophysics	5
IND 501	Ethics in Research	1
BPH 571,572	Biophysics Seminar (each semester)	1
BPH 595	Ph.D. research (each semester)	

Elective course: At least one elective course must be taken. The choice must be approved by the Ph.D. advisor and Program Director. Recommended courses are listed below.

IND 408	Advanced Biochemistry	5 credits
IND 409	Cell Biology	4
IND 412	Advanced Topics in Biological Macromolecules	5

Other requirements:

Two research rotations should be conducted prior to joining a laboratory for dissertation research. Students are encouraged to complete these rotations during the first two years of the M.D. program.

The qualifying examination must be completed by the end of the second year of Ph.D. studies.

The teaching assistant requirement is waived.

At least one meeting per year with the thesis advisory committee (normally held after the student's Biophysics Seminar presentation).

A satisfactory thesis must be written and successfully defended. Details of these requirements are given elsewhere in this handbook.

III. ADDITIONAL DETAILS OF PROCEDURES AND REQUIREMENTS

A. Faculty Advisors for Entering Students

Each first year student will be assigned a faculty advisor, based on the student's expressed interests. This will be done by the Graduate Studies Director in consultation with the Education Committee. Students should meet with the advisor frequently (monthly is desirable) and should consult with him/her about research rotation choices, coursework, and any other questions or problems which they encounter. The faculty advisor will be formally responsible for advising the student until the student has selected a Thesis Advisor.

B. Student Laboratory Rotations

All first year students are required to complete three laboratory rotations during the first year. Laboratory rotations in three different laboratories are required but additional rotations may be taken. Additional rotations can be taken either in the summer prior to entering the program or in the summer following the first academic year. Two consecutive rotations in the same laboratory will not be allowed.

At the beginning of the academic year, faculty members will present short (20-30 minute) informal lectures to the incoming students describing their research activities. The goals of this series are to acquaint students with ongoing research in the BSB Program and to alert them to opportunities for their laboratory rotations and future Ph.D. research. **Attendance at these lectures is strongly encouraged.** At the end of this series of presentations, students are expected to sign up for laboratory rotations by submitting a list of 3 choices to the Graduate Studies Administrator. Before selecting a list laboratory choices for any rotation, a student should meet with his or her advisor to discuss his or her choices for laboratory rotations and the advisor must sign off on the student's list. **At a minimum, one rotation must be in the laboratory of a faculty member who qualified to serve as a thesis advisor in the BSB Program.** Near the end of the first and second rotations, students should submit 3 choices for the subsequent rotation to the Graduate Studies Administrator. Subsequent rotations may be done in any active research laboratory in the Program (including laboratories in the Chemistry department), or in other laboratories in the Medical Center. Every effort will be made to accommodate the students' choices. Students are expected to complete 3 projects in 3 different laboratories *representing more than one area of interest* before requesting assignment to a laboratory in which their Ph.D. research project will be completed.

Students will be evaluated at the end of each rotation period. The written evaluations will be kept in the department file and a copy will be sent to the dean's office. These evaluations will also be used to fulfill the progress report requirement in the first year (see below).

Rotation Schedule 2009 - 10

Faculty research presentations	Sept 3 – Sept 24
Meetings with 1 st year advisor	Sept 25 – Sept 30
Submit rotation choices	October 1
Receive rotation assignment	October 5
Begin rotation	October 6
Rotation period ends	December 23
Meet with advisor	December 9-11
Submit rotation choices	December 14
Receive rotation assignment	December 18
Begin rotation	January 4
Rotation period ends	March 5
Meet with advisor	February 24-26
Submit rotation choices	March 1
Receive rotation assignment	March 4
Begin rotation	March 8
Rotation ends	May 21
Choose permanent advisor*	mid-May
Begin work in permanent lab	May 24 or when approved

*Some students may request an additional rotation.

PLEASE NOTE: Graduate students are expected to be in residence, working in laboratory rotations, during semester, fall and spring “breaks” listed on the University (undergraduate) academic calendar. The Graduate School calendar is included in the Appendix.

C. Radiation Certificate

All students are to pass Health Physics Radiation Safety tests 1 and 2 by December 1 of their first year such that they qualify as an Authorized User of Radioisotopes. A lecture and information regarding these tests will be presented at Orientation. Radiation certification does not count toward the 30 hours of course credit necessary for the Ph.D.

D. Student Research Seminars

Experience in organizing research data, interpretation of data, synthesis of information from diverse sources, and presentation to an audience of scientific colleagues represents valuable preparation for a career in science whether in an academic or industrial setting. Therefore, BSB students will be required to present a yearly seminar in the

student series beginning in their second year of study. Thesis Committee meetings should be arranged to immediately follow the student's seminar if all committee members are available. Otherwise, the meeting must take place within one month of the student's seminar date or before June 1, whichever comes first.

All students will register for this seminar series each semester: BPH 571 (Fall) and BPH 572 (Spring). Credit will be awarded for presentation of a seminar in the series (once a year, beginning in the second year) and for attendance at 65% of the seminars in each semester (every year). If a student fails to attend 65% of the student seminars in a given semester, he/she will be given a failing grade.

During the course of studies, students will be required to make at least 6 seminar and/or poster presentations. Presentations at the Student Seminar Series or in another approved seminar course will fulfill this requirement. University poster sessions and other scientific meetings may also be used to fulfill the requirement with the approval of the Curriculum Committee chair. An abstract or outline of each presentation is required for the file in the Department Office.

E. First Year Preliminary Examination and Evaluation

On Monday following exam week in May, the Graduate Studies Director and Education Committee Chair will meet formally with students to discuss the expectations for performance in the examination. Each student will be given a list of articles selected by department faculty and screened by the Director of Graduate Studies for suitability for the purposes of the examination, and for variety of subject matter. The student will select one of the articles for the examination. Each article may be used by only one student.

By Friday at noon, the student must indicate in writing to the Department Office which of the articles he/she has chosen to serve as the basis of the examination. Within 14 days following article selection, the student must submit to the Department Office a carefully written document, comprising 10-15 double-spaced, typewritten pages (excluding references), containing four sections:

- (1) questions addressed by the article, i.e. What questions does the article try to answer and how significant are they?
- (2) critical appraisal of the article, i.e. How effective is the article in answering the questions posed? Do the results support the conclusions?
- (3) proposals for additional research, i.e. What additional work needs to be done, or what interesting questions can be pursued on the basis of what has been learned from this article?
- (4) references (not included in page limitations).

These sections are to be as specific and comprehensive as the length restriction allows, and the student should understand that there will be an opportunity to expand on any aspect of the document during the oral part of the examination. The examination anticipates the

application of all information and understanding gained in graduate course work and undergraduate background.

First Year Examination Rules

Each first year student will be asked to analyze **independently** a paper he or she has selected from the set of papers recommended by the faculty. In order to maintain a uniform policy in regard to responding to questions that may be posed by first-year students to you, faculty, pre- and post- doctoral students should abide by the following guidelines:

- 1) It is appropriate to answer questions that are directed to understanding technique or theory.
- 2) It is appropriate to suggest additional references if you know of either helpful basic texts or review articles.
- 3) It is **inappropriate** to offer an opinion on the quality or defects of the paper chosen by the student or to answer a question such as “What experiment would you do next?”
- 4) It is **inappropriate** to read and criticize a draft of the student’s paper before the exam date.

NOTE: Students should be very careful to develop their *own* analysis of the chosen work and to express it in their *own* words. Reiterating the analysis of others (without proper citation) either in paraphrase or verbatim from published works is considered plagiarism and is a very serious offense that may lead to dismissal from the University. The policy on plagiarism is detailed in Section VII of this handbook.

The written document, together with a copy of the selected article, will be distributed to the members of the examining committee. This committee will consist of three members chosen by the Graduate Studies Director: the faculty member submitting the selected article, a member of the Education Committee, and one other member of the BSB Program.

Approximately 1-2 weeks after submission of the document, the student will have an oral examination before this committee. The oral examination will start with a 20-minute presentation by the student, during which the student presents and explains his/her analysis of the selected article, keeping in mind that the committee consists of experienced and knowledgeable scientists who are not necessarily expert in the research area of the selected article but who have read and studied both the selected article and the student's submitted document. The balance of the examination will be devoted mainly to questions raised by the committee.

The examining committee assesses the student's performance with respect to four criteria:

- (1) the student's ability to evaluate published research critically and fairly,
- (2) the student's ability to draw upon graduate course work to analyze the research,
- (3) the student's creativity in suggesting new and justified research, to improve and/or extend the study
- (4) the strength of the content and the clarity of the writing of the submitted document
- (5) the ability of the student to defend, modify or extend the document during oral debate.

The quality of the written presentation will be evaluated in order to decide if the student may be permitted an exemption for the BPH 567 writing course.

At the end of this oral examination, the committee meets in closed session to evaluate the student's performance and arrive at a consensus opinion of the student's performance. Included in that evaluation will be whether or not the quality of the written document is sufficient to warrant exemption from the required course on Proposal Writing. At the end of this session, the committee chairperson will discuss with the student the strengths and weaknesses found in the examination, and will inform the student of the intended *recommendation* (pass or fail) to the Education Committee. The chairperson cannot tell the student at this time whether or not he/she will be able to continue in the program.

Soon after all the first-year oral examinations have been completed, the Education Committee will meet to hear the reports from the examining committees and to examine the records (course work, etc.) of the students. Based on these discussions, the Committee will recommend to the BSB Program faculty whether the student should remain in the program, be examined by a different preliminary exam committee, or, in unusual cases, leave the program. The decision of the BSB faculty will be reported to the students as quickly as feasible by the Director of Graduate Studies.

F. Teaching Assistantship

Student teaching is viewed as an integral part of student learning, both as a means of consolidating their own knowledge and as a means of learning how to transmit effectively that knowledge to others. Each biophysics student is required to act as a teaching assistant for at least one semester. Usually, this will be during the second year. However, those students for whom English is a second language, may, if they wish, request that the teaching assistantship be delayed until the third or fourth year. If such a request is granted, the student is expected to make every effort to increase their verbal English skills to an appropriate level. Students are welcome to request specific teaching assignments and every effort is made to accommodate such requests. Teaching assignments are made by the Program Director in consultation with the Course Directors.

G. Selection of Thesis Advisor

After completing three research rotations (usually at the end of May) and successfully passing the first year examination, students may submit their choice for thesis advisor to the Department Office. Every attempt will be made to place students in their first-choice laboratory, but limitations of space and funding may, in very rare cases, make it necessary to assign a student to a second choice. If a student does not feel prepared to choose a thesis advisor at this time, he/she may elect to do an additional rotation in the summer after the first year. Final choices of thesis advisor are subject to the approval of the Education Committee of the BSB Program.

The research advisors currently in the BSB program are: William Bernhard, Kara Bren, Mark Dumont, Tom Foster, Alan Grossfield, Tom Gunter, Jeff Hayes, Clara Kielkopf, Todd

Krauss, Tom Krugh, Lynne Maquat, Dave Mathews, Jim McGrath, Ben Miller, Lukas Novotny, Eric Phizicky, Lewis Rothberg, Harry Stern, Peter Shrager, Alan Smrcka, Doug Turner, Rick Waugh, Joseph Wedekind and David Yule.

The BSB program provides a broad array of opportunities for graduate education in the area of Biophysics and Structural Biology. Students in the BSB program are free to choose any of the faculty advisors within the BSB program as their Ph.D. advisor. In the unusual situation where a student wishes to select a thesis advisor who is not a member of the BSB Program, the student formally has two options. First, the student may request to join the degree program of the intended thesis advisor. That program must approve the request of the student. The second option, which would only be approved under exceptional circumstances, is that the student would remain in the BSB degree program with a BSB faculty member as co-advisor. Appointment of a co-advisor, which must be approved by the BSB Program faculty, would only occur in cases where a BSB faculty member can be identified who has sufficient knowledge in the proposed area of research to provide substantive advice and guidance to the student. In order to earn a Ph.D. in Biophysics, a student is expected to remain in the BSB program and must satisfy the degree requirements of the program, as outlined in this handbook.

Conditions under which a thesis advisor can resign. A faculty advisor may resign as the advisor of a student because he or she believes that the student's performance or behavior is unsatisfactory or because of incompatibility between the advisor and the student. Before asking the student to leave his or her laboratory, the advisor should discuss the problem with the student and must discuss the problem with the Director of the BSB Program and obtain his or her approval. The Director will consult with the members of the Education committee and, if warranted, the BSB faculty as a whole. The student must be given 60 days warning before termination of the student stipend. The student may attempt to find a new research advisor during this period; if a BSB advisor is found, the student will be allowed to remain in the program.

H. Thesis Advisory Committee

Following selection of the research advisor, the student's thesis advisory committee is selected. The thesis advisory committee performs several functions. It may help the student choose specific elective courses in preparation for the chosen field of research. It provides advisory input during the development of the thesis research project with respect to scientific merit, techniques and methodology, relevant literature, etc. It gives final approval of the specific program presented for the thesis topic to be developed. The members (other than the thesis advisor) along with a member of the BSB Education Committee, serve on the committee for the Qualifying Examination. Finally, it, along with a representative appointed by the Dean's Office, is the examining committee for the thesis defense. By September 30 of the second year, the student and the research advisor must submit a list of suggested committee members to the program administrator. This thesis advisory committee must be approved by the Education Committee.

The thesis advisory committee should have a minimum of four members, including the thesis advisor, at least two members of the “primary” faculty in the Department of Biochemistry and Biophysics (see appendix), one faculty member from “outside” the department and a 4th member who can be primary or outside. If the research advisor is not a primary member of the Department of Biochemistry and Biophysics, he or she cannot be considered the “outside” member but will be considered the 4th member of the committee. At least one member of the advisory committee should have trained a graduate student through completion of the Ph.D. Additional committee members may be included from either within or outside the University if it is considered useful or necessary. Thus, the minimum size of the committee will be four members, but five (or more) is quite possible. In the case of joint co-thesis advisors, a minimum of five members may be required.

I. Yearly Progress Report

A yearly progress report must be submitted to the Associate Dean for Graduate Studies by June 1 of each academic year in order to have stipend funding approved for the following year. Students should plan to meet with their thesis advisory committee and file a Graduate Student Research Review form (see appendix) in the Department Office during each academic year. In the first year of studies, the laboratory rotation evaluations will be used to fulfill this requirement (see above).

The annual meeting with the thesis advisory committee should be scheduled to immediately follow the student's seminar, provided that all committee members are able to attend. Otherwise, the committee meeting must be scheduled to take place within one month of the student's seminar date or before June 1, whichever comes first.

IV. QUALIFYING EXAMINATION PROCEDURES

A. General Procedures

The purpose of the Qualifying Examination is to determine whether the student is qualified and competent to continue work toward a Ph.D. in Biophysics. It is not intended as a test of the proposed research problem or of the supporting experimental data, but rather as a means of determining the potential of the student for independent thought and his or her comprehension of the general field and capacity for exploiting a relevant problem in a scientifically sound manner.

The examining procedure involves preparation by the student of a written Ph.D. thesis research proposal. Because a career in science will undoubtedly involve submission and defense of research proposals (whether in an academic or industrial setting) we recommend using a modified NIH proposal outline as described below. **The School requires that the Examination be taken by the end of the fifth semester of study.** Students in the Biophysics Program typically take the examination in September or October. *The Qualifying Examination will be carried out by the thesis advisory committee and a member appointed by the Program Director who will replace the student's thesis advisor for the examination. The advisor will not be present at the examination.*

Students must have completed a minimum of 24 hours of course work credit, as outlined above, at the time of the Qualifying Exam. The completed Ph.D. thesis research proposal must be submitted to each member of the thesis advisory committee and to the Department Office at least 10 business days before the day of the examination.

Students in the Ph.D. Program in Biophysics receive a "Plan B" Masters degree after passing the Ph.D. Qualifying Examination. The number of credit hours required for the "Plan B" Masters is 30, as described above, of which a minimum of 24 must be course work.

B. Procedure

1. Schedule Qualifying Examination with committee members and the faculty member appointed to the exam committee a minimum of 4 weeks prior to the exam.
2. At least 4 weeks prior to the exam, inform the program administrator of date/time of the exam, confirm committee members and schedule a room. Submit title and abstract online at this time. The program administrator will complete paperwork and submit to the Registrar.
3. Submit a copy of the proposal a minimum of 10 business days before the exam to each committee member and the program administrator.
4. The annual Research Review form may be completed at the time of the Qualifying Exam. The form is available in the department office. Please return to program administrator.

Note: The chair of the Qualifying Exam Committee will be appointed by the Senior Associate Dean. Notification of the exam will be sent to committee members by the Registrar.

C. Guidelines for Preparation of the Written Ph.D. Thesis Research Proposal

i. Overall area of the Proposal: Because students will have the most familiarity with the scientific area corresponding to their thesis research, it is expected that the research proposal will be drawn from this area. However, it need not correspond exactly to the student's planned thesis goals and experiments.

ii. Preparation and Format: In order to provide students with an introduction to the methodology of research proposal writing, the Department of Biochemistry and Biophysics offers a two-credit course (BPH 567) each Spring semester. Students in their second year of study are required to complete this course for credit. As part of the course requirements, students will prepare a research proposal that may serve as the basis for the Qualifying Examination proposal. The format of the proposal should follow the NIH R21 format as follows:

iii. Guidelines for Getting Help and Feedback from Others: Successful scientists rely on communication with their peers to produce the best product possible: proposal preparation is often an iterative process of draft writing, evaluation by others, feedback, and re-writing. However, no scientist can be successful without the ability to independently focus on a research area and develop a plan of experimentation that solves important problems in that research area. Thus, it is an absolute requirement that the overall goals of the proposal (the Specific Aims) and the specific experiments designed to achieve those Aims are to be articulated by the student alone. During the proposal writing course, students will receive extensive feedback primarily centering on writing style and the elements of writing a logical proposal. Occasionally, a "fatal flaw" in experiment may be pointed out, or the need for additional justification (or experimentation) discussed. Likewise, students may ask peers and their advisor to provide comments on writing style, logical flow, and details of experimental techniques.

D. Suggested Outline for Qualifying Examination Research Proposal

Page lengths are based on standard double-spaced pages. Do not exceed 15 pages, for sections i-iv. Guard against plagiarism.

i. Specific Aims: State concisely and realistically what the research described in the proposal is intended to accomplish and/or what hypothesis is to be tested. Do not exceed two pages.

ii. Background and Significance: Briefly sketch the background to the proposal and critically evaluate existing knowledge, clearly indicating the gaps in knowledge that will be filled by the proposed research. State concisely the importance of the research described in the proposal by

relating the specific aims to longer term objectives. Do not exceed five pages.

iii. Preliminary Studies: Students are not expected to have a large amount of data accumulated at the time of the Qualifying Examination but should include any that they have. This section should summarize what work has been done by the student to indicate that the proposal is realistic and significant in scope. Do not exceed four pages. Graphs, diagrams, tables, and charts relevant to this section can be included as "Appendix" material.

iv. Proposed Strategy and Experiments: Discuss the overall strategy to address the specific aims and describe in detail the experimental design and the procedures to be used to accomplish the specific aims of the work described in the proposal. Describe the protocols to be used and a tentative timetable for the investigation. Include a discussion of the possible results of the proposed experiments and how each result will be interpreted. Describe new methodology and its advantage over existing methodology. Discuss the potential difficulties and limitations of the proposed procedures and alternative approaches to achieve the aims. There is no page limitation for this section, but make every attempt to be concise.

v. References: Use a standard journal format that includes all authors and the title of the article.

vi. Appendix: Graphs, diagrams, tables, and charts supporting the proposal should be included in this section.

E. Oral Qualifying Examination Format

The student is expected to present an overview of the thesis research proposal for the first 15-20 minutes using blackboard, slides or overhead projector. The committee will then examine the student orally. A typical examination will take between two and three hours. The candidate is judged on: the written and oral presentation, a grasp of the fundamental issues, the ability to apply the background from formal course work to problems related to the proposal, and a demonstration of critical assessment of results. It is important to recognize that while the written proposal serves as a focus for the oral examination, questions about related areas can be raised.

F. Results of Qualifying Examination

The Chair of the examining committee or the committee as a whole will discuss with the student the strengths and weaknesses of the qualifying exam performance,

and will inform the student whether or not he/she has passed the examination. The Chair will also report strengths and weaknesses to the student's thesis advisor, and will report whether the student has passed or failed to the Senior Associate Dean for Graduate Studies of the Medical School and to the Graduate Studies Administrator, who will inform the Director of Graduate Studies.

In the event that a student fails the examination, the student's performance will be reviewed by the BSB faculty and a recommendation made to the Senior Associate Dean of Graduate Studies. The recommendation may be that the student retake the qualifying examination or leave the program.

V. THESIS PREPARATION AND REGISTRATION

A booklet entitled "The Preparation of Doctoral Theses" is available on-line at

<http://www.rochester.edu/Theses/>

It is the responsibility of the student to see that style, format, margins, paper, binding, etc. are in accordance with University regulations. The student should be aware that the Dean of Graduate Studies has a deadline each year by which time a thesis must be registered in order to allow graduation at the next Commencement. This date is typically the first week in April although students must notify his office by February 1 of their intent to register a thesis before the deadline. It will usually take at least three months to prepare the thesis after all experimental work is complete and the most common mistake lies in not allowing adequate time for preparation of illustrations, typing, review by the advisor and thesis advisory committee and for registration in the Graduate Dean's Office.

Registration with the office of the Dean of Graduate Studies must take place at least three weeks before the final exam.^v In Preparation for registration, the student should begin the process by meeting with the Graduate Studies Administrator when first discussing a defense date with advisor and committee. The paperwork process starts at least 6 weeks before registration with the following information.

1. A list of the members of the thesis advisory committee
2. Date, time and place for the proposed final exam^{vi}
3. One copy of the thesis title page
4. One copy of the thesis abstract

The Graduate Studies Administrator in the Department Office will complete the paperwork and forward to the Senior Associate Dean's office. The student will be contacted by the Registrar with further instructions. The student will meet with the Registrar before formal registration with the Dean of Graduate Studies. At registration, the student must bring to the office of the Dean of Graduate Studies a copy of the thesis to be given to the outside member appointed to the committee. All other committee members should also receive a copy of the thesis at this time.

^v Registration deadlines vary. Please check in the Department Office for a schedule of dates for the academic year. Final exams may not be scheduled during specific periods, e.g. August through mid-September.

^{vi} If the examination takes place during Fall or Spring semester, do not schedule the examination on a Tuesday, Wednesday or Friday afternoon.

VI. FINAL EXAMINATION AND TERMINATION

Before the exam, the student's thesis advisor will receive confirmation of the scheduling of the exam and name of the Chairperson of the Examining Committee appointed as the representative of the Dean of Graduate Studies.

The format of the Final Examination for the Ph.D. is as follows. The first hour of the exam is an open seminar to the department. The student's presentation should last 50 minutes and 10 minutes are allowed at the conclusion for questions from the audience. Notes, slides, charts, and the usual visual aids for a seminar are permitted. The student and the Examining Committee will then adjourn to a private session where the second part of the exam will be conducted. Using oral interrogation, the committee will scrutinize the student's comprehension, execution, description and interpretation of the research described in the thesis.

After successful completion of the Final Examination and after making any required corrections in the thesis, the student must submit one corrected copy of the thesis to the office of the Associate Dean. This copy must be unbound in a manila envelope with the student's name and department marked plainly on the outside. In addition, one bound copy must be submitted to the Department Office.

A Termination Form should be completed and returned to the Department Office with a copy of the student's C.V. after the defense. The termination date will determine when the stipend payment will cease. The student should discuss this with his/her advisor.

VII. POLICY REGARDING PLAGIARISM

Plagiarism is an extremely serious ethical and moral offense. Any suspected instances will be reviewed by the Graduate Advisory Committee, the Department Chair, the Senior Associate Dean for Graduate Studies and appropriate University officials. This review can lead to suspension or expulsion from the University. According to University policy, academic transcripts issued during periods of suspension or expulsion will be accompanied by a letter from the registrar indicating that the student is currently suspended or expelled from the University for disciplinary reasons. Ignorance of the policy regarding plagiarism will not be considered as an excuse for violations

Plagiarism is defined and explained by the following statement, which is taken verbatim from the Medical Student Handbook.

"Students are sometimes uncertain about what constitutes misuse of another person's expressed ideas. This statement is designed to explain the limits normally used to define plagiarism.

- 1. Plagiarism is literary theft, intentional or unintentional. It is the use of a unique idea or phrase which does not originate with the user, without proper acknowledgment of the source.*
- 2. In written papers, due credit to the original source of major or unique ideas (i.e., ideas which you could not and did not arrive at by yourself) must be given in the form of footnotes or clear allusions at the proper places in the paper itself. These precise indications of source must be given whether the material is paraphrased or quoted directly. An appended bibliography only is insufficient acknowledgment.*
- 3. Quotation marks must enclose all direct quotations even though the quoted material is no more than occasional phrases interspersed with original observations.*
- 4. Illegitimate use of written material or the obtaining of information from other students while an examination is in progress [also] constitutes plagiarism." **

*University of Rochester, Medical Student Handbook, Website Edition, 2003,
(<http://www.urmc.rochester.edu/smd/stdnt/handbook/plagiarism.html> and reference therein)

VIII. GENERAL POLICIES

A) Space: The Department Office will assign first-year students a desk from the general departmental "pool" of office space. Once a research advisor has been chosen, the student will usually be given a desk in the advisor's area.

B) Travel: Students may apply for very limited travel funds toward the end of their program to attend national or international meetings. Advisors are usually responsible for travel support. Travel awards are also available through the Graduate Student Society.

C) Vacations: Graduate students are supported by fellowships or research grants from a variety of sources, both internal and external, and each agency has slightly different regulations regarding vacations. In general, most state that fellows and trainees are expected to engage in full-time study and are entitled only to official University Holidays (New Year's Day, Memorial Day, 4th of July, Labor Day, Thanksgiving Day and the Friday Following Thanksgiving Day, Christmas Day). The School of Medicine allows a 2 week vacation period per year in addition to these holidays. **Semester breaks are not to be considered holidays** (see the SMD Academic Calendar) and any absence during those times must be approved in advance. The Department must submit monthly time reports on all graduate students and these are subject to close scrutiny by auditors from both the governmental accounting office and the University. **Thus, every student should inform his or her advisor of any absence and an absence of more than one week must be cleared with the Graduate Studies Administrator at least one month in advance. In addition, international students must follow procedures set by the International Student's Office. Students will not receive stipends if absent without authorization.**

IX. PROGRAM AWARDS

The **Leon L. Miller Fellowship** is awarded yearly to a student entering the Ph.D. program in Biophysics that shows outstanding promise for achievement in academics and research.

The **William F. Neuman Award** is awarded yearly for academic, scientific and personal qualities which exemplify the imagination, enthusiasm and excellence in the pursuit of scientific knowledge which were characteristic of the life of Dr. Neuman.

The **George V. Metzger Award** is awarded yearly to an outstanding Ph.D. candidate for excellence of the Ph.D. thesis and in the research leading to the dissertation in the Program in Biophysics.

APPENDIX

2009-10 Academic Calendar

Department of Biochemistry and Biophysics Faculty

BSB Program Faculty

Course Descriptions

Forms:

- Research Rotation Evaluation
- Graduate Student Research Review
- Leave of Absence Request

PLEASE NOTE: Your street address should be kept current in HRMS, the Student Registrar System and the Department system. International students also must change their address with the ISO and the Federal Government.

HRMS – www.rochester.edu/people

Student Registrar System – www.rochester.edu/its/acs/oge_address_form.html

Department office – send an email to Rose or Katie with the change

ISO/Government – www.iso.rochester.edu/addressform.htm