UNIVERSITY OF ROCHESTER

SCHOOL OF MEDICINE AND DENTISTRY

Graduate Studies in

BIOPHYSICS, STRUCTURAL AND COMPUTATIONAL BIOLOGY

Student Handbook

August 2024 **David Mathews, Program Director**
Joseph Wedekind, Education Chair
Marianne Arcoraci, Graduate Studies Coordinator

PREFACE

The Biophysics, Structural and Computational Biology (BSCB) Faculty 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 Coordinator*.

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I. DEFINITIONS

Biophysics, Structural and Computational Biology (BSCB) Program Director (David Mathews) leads the activities of the program.

Steering Committee of BSCB Program is responsible for monitoring student progress through the educational program, and for curriculum development.

Education Chair (Joseph Wedekind) 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 is selected at the beginning of the second year, and is responsible for monitoring student progress toward the Ph.D. degree. The committee provides advice and consent with regard to the student's thesis research objectives.

Graduate Studies Coordinator (Marianne Arcoraci) keeps graduate student records and handles 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 2025

IND 408	Advanced Biochemistry	4 credits
IND 431	Foundations in Modern Biology	5
IND 501	Ethics & Professional Integrity in Research	1
BPH 571	Biophysics Seminar	1
BPH 595	Ph.D. Research (Rotation)	5
Total		16 credits

Spring Semester 2025

BCH 412	Advanced Topics in Biological Macromolecules	5 credits
BPH 411	Methods in Structural Biology	2
BPH 509	Molecular Biophysics	2
BPH 572	Biophysics Seminar	1
BPH 595	Ph.D. Research (Rotations)	6
Total		16 credits

Subsequent Semesters

BPH 567	Writing Proposals in BPH	1 credit
BPH 571, 572	Biophysics Seminars [each semester]	1 credit
	Elective course – consult with advisor	3 credits or higher

2. Elective Courses

A total of at least 24 graduate course credit hours must be accumulated before taking the Qualifying Examination. A majority of these credits (20 credit hours) are fulfilled by the required courses of the program (IND 408, 431, BCH 412, BPH 411, 509, 567). One-two additional elective course totaling 4 credit hours must be taken in the second year of study. Any graduate course offered by the University of Rochester may be used as an elective provided it is appropriate to your area of research. Some of the courses listed below provide the fundamental background that is commonly needed for biophysics students; 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 the Appendix for course descriptions.

Partial list of electives

Fall Semester Courses (credit hours)

BCH 521	Bioinformatics for Life Scientists (4)
BCH 570	Multilayered Control of Gene Expression (1)
BIO 402	Molecular Biology (4)
BST 430	Intro to Statistical Computing (3)
CHM 423	NMR Spectroscopy (2)
CHM 451	Quantum Chemistry I (4)
CHM 469	Computational Chemistry (2)
MBI 473	Immunology (3)
NSC 512	Cellular Neuroscience (5)
PHP 403	Human Cell Physiology (4)

Spring Semester Courses (credit hours)

BME 442	Microbiomechanics with Microfluidics (4)
CHM 416	X-ray Crystallography (2)
CHM 440	Bioorganic Chemistry (4)
IND 443	Eukaryotic Gene Regulation (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
- Middle of May: Choose paper for first year exam, choose laboratory
- Beginning of June: Take first year preliminary exam
- Middle of June: Begin Ph.D. research

Second Year

Fall Semester

- No later than September 30th, 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
- 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 Section III F).

Third Year

- Qualifying Examination should be taken before the start of the fifth semester of studies by October 1st (see Section IV).

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

C. Other Educational Opportunities

1. Departmental Seminars

The Department of Biochemistry & Biophysics, other departments in the School of Medicine & Dentistry and in the College sponsor seminar series with outside speakers. While not considered formal courses with associated credit, these seminars are an important part of the graduate student experience, which aims to provide a broad and diverse background of biology for those with quantitative backgrounds. Every effort must be made to attend and participate whenever possible.

2. BSCB Program Retreat - (Biennial)

The BSCB program holds a biennial retreat using a Gordon Conference format. It is a one-day event that starts with breakfast, includes lunch, and ends 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.

3. Bioinformatics Cluster

For students interested in computational biology, it is strongly encouraged that they attend the monthly Bioinformatics Cluster meeting. These meetings generally occur on the second Thursday of the month at 11:30 am for seminars by intramural and extramural speakers.

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 min 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 Steering Committee. The critique written for the First Year Preliminary Exam, if high enough in quality, is one means of exemption and the final 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 Steering Committee as a basis for exemption.

E. Minimum Course Performance

If a student in the program receives one grade of "C" or below, s/he will be reviewed by the Program faculty. A recommendation will be made to the dean that may include termination from the program. Note; two C grades are automatic grounds for expulsion from the Program by the dean's office. If the student is allowed to remain in the program with one "C," the course (or an appropriate substitute) must be re-taken successfully with a final grade of B- or higher.

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

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 possible 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	2 credits
BPH 509	Molecular Biophysics	2
IND 501	Ethics & Professional Integrity in Research	1
BPH 571,572	Biophysics Seminar (each semester)	1
BPH 595	Ph.D. research (each semester)	

Elective course: At least two elective courses must be taken. The Ph.D. advisor and Program Director must approve this choice. Recommended courses are listed below:

IND 408	Advanced Biochemistry	4 credits
BCH 412	Advanced Topics in Biological Macromolecules	5
BCH 521	Bioinformatics for Life Scientists	4
IND 431	Foundations in Modern Biology I	5
IND 432	Foundations in Modern Biology II	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 third year of Ph.D. studies.

The teaching assistant requirement is waived.

At least one meeting per year must be held 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 for the first year, based on the student's expressed interests (if possible). This will be done by the Graduate Studies Coordinator in consultation with the Education Chair. 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 that they encounter. The faculty advisor will be formally responsible for advising the student until s/he 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 can be taken. Additional rotations will take place either in the summer prior to entering the program or in the summer following the first academic year. Prior to the completion of three different rotations, 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 min) informal lectures to the incoming students to describe their research activities. The goals of this series are to acquaint students with ongoing research in the BSCB 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 three choices to the Graduate Studies Coordinator. Before selecting laboratory choices for any rotation, a student must meet with his or her advisor to discuss 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 is a member of the BSCB Program**. Near the end of the first and second rotations, students should submit their three choices for the subsequent rotation to the Graduate Studies Coordinator. Again, the rotation choices must be approved by the acting advisor. Subsequent rotations may be conducted in any active research laboratory in the Program (including laboratories in the Chemistry or Biology departments), or in other laboratories in the Medical Center. Every effort will be made to accommodate the students' choices. Students are expected to satisfactorily complete three projects in three 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's files 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 2024 – 2025

Faculty research presentations	September	4 – 18
Meetings with 1st year advisors	September	by September 20
Submit rotation choices	September	20
Receive rotation assignment	by September	27
Begin rotation	October	01
Rotation period ends	December	15
Evaluation Forms Due	December	18
Reports Due	December	28 *Report is at discretion of the PI, check with faculty

Meet with advisor	November 29 – December 18
Submit rotation choices	December 18
Receive rotation assignment	December 23
Begin rotation	January 01 (Confirm with PI)
Rotation period ends	March 15
Evaluation Forms Due	March 20
Reports Due	March 30 *Report at discretion of the PI, check with faculty

Meet with advisor	February 27 – March 3
Submit rotation choices	March 3
Receive rotation assignment	by March 7
Begin rotation	March 16 (Confirm with PI)
Rotation ends	May 31
Choose thesis advisor*	mid-May
Evaluation forms Due	June 5
Begin work in permanent lab	After 1st year exam

*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 must pass Health Physics Radiation Safety tests 1 and 2 by December 1 of their first year in order to 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

The objectives of the Biophysics seminar series are multifold. These include: gaining experience in the organization of research data, the interpretation of data, synthesis of information from diverse sources into a testable model or hypothesis, and presentation of original information to a broad audience of scientific colleagues with diverse experimental and theoretical backgrounds. Such seminars are intended to provide valuable preparation for a scientific career in academic or industrial settings. Therefore, BSCB students will be required to present a yearly seminar in the student series beginning in the second year of study. Thesis Committee meetings should be conducted immediately after the student's seminar (pending committee member availability). 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 the student seminar series each semester: BPH 571 (Fall) and BPH 572 (Spring). Each student is expected to ask at least two questions per semester. Credit will be awarded for presentation of a seminar in the series (once a year, beginning in the second year) and for attendance at ≥75% of the seminars in each semester (every year). Students are required to demonstrate their attendance by signing the list of attendees **prior to** the commencement of class; this record of attendance will be checked weekly throughout the semester. If a student fails to attend 75% of the student seminars in a given semester, s/he must write a 750-word summary for every missed student seminar that places him or her below the mandatory attendance level. The seminar assigned as the subject of the 750-word summary will be that from Departmental seminar series held Wednesday at 2 pm. Other seminars can be substituted with approval from the BPH 571/2 course directors (Prof. Paul Boutz & Eric Phizicky).

During the course of their studies, students will be required to make at least six 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 fulfill the requirement with the approval of the Education Chair. An abstract or outline of each presentation is required for the file in the Department Office.

E. First Year Preliminary Examination and Evaluation

In April, the Graduate Studies Director and Education Chair will meet formally with students to discuss the expectations for performance on the examination. Student will be given a list of articles selected by Program faculty and screened by the Education Chair for suitability based on the purpose of the examination, and for variety in subject matter. The student will request to be assigned one of the articles for the examination. Each article may be used by only one student; conflicts arising will be resolved by the Education Chair.

By Friday at noon, the student must indicate in writing to the Department Office which of the articles s/he has chosen to serve as the basis of the examination. Within 14 days following

article selection, the student must submit to the Graduate Studies Coordinator, or proxy thereof, a carefully written document, comprising 10-15 double-spaced, typewritten pages (excluding cover page, figures, tables, schemes, references and title page that must include a title, the student's name, exam date, time and exam location), font 11pt. Arial or 12 pt. Times New Roman with 1" margins on all sides. This document must be sent via email as a PDF with the subject line in the format of Last Name – 1st Year Exam Proposal. The proposal should comprise the following four sections:

(0) Cover page (not included in page limitations) with name of student, exam date and time, exam location, and citation of article. Do not exceed one page.
(1) Questions addressed by the article, i.e. What questions does the article try to answer and how significant are they? What hypotheses are being tested? This section should be approximately 1-2 pages.
(2) Critical appraisal of the article, i.e. How effective is the article in answering the questions posed? Do the results support the conclusions? This section should not exceed 1-2 pages.
(3) Proposal for additional research, i.e. What additional work needs to be done (if any), or what interesting questions can be pursued on the basis of what has been learned from this article? This section should be substantial with specific expectations for success or failure, including alternative approaches if the primary experimental plan does not succeed. This should be the longest section.
(4) References (not included in page limitations). Any reference style can be used, but it should include the complete reference title and all authors (up to 6).

These sections are to be as specific and as comprehensive as the length restriction allows. Each page should be numbered in the page footer. 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 as well as undergraduate background, or other research experience. Note; late submission of an exam will result in the deduction of 1 point per day from the written-exam score, which is rated on a 10 point scale. Here, a day means any day of the week with no special consideration of weekends or holidays; as such, every late day is a 1 point deduction from the committees average score on the written exam. Only the Graduate Studies Coordinator or Program Director can allow extensions. Such requests must be requested in writing at least 24 h prior to the submission deadline.

First Year Examination Rules

Each first-year student will be asked to analyze **independently** a paper s/he has selected from the set of papers recommended by the faculty. In order to maintain a uniform policy with regard to responding to questions that may be posed by first-year students preparing for the exam, the BSCB Program requires that faculty, graduate students, post-doctoral trainees, and scientific technicians abide by the following pre-exam preparation 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. Also see Section X of this handbook on the use of Artificial Intelligence.

The written document, together with a copy of the selected article, will be distributed to the members of the examining committee. This committee will comprise three members chosen by the Graduate Studies Director or Education Chair: the faculty member submitting the selected article and two other members of the BSCB Program with at least peripheral knowledge of the topic.

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 min 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 experts in the research area of the selected article but who have read and evaluated both the selected article as well as the student's written 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 five 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 their written document during oral questioning.

At the end of this oral examination, the committee meets in a closed session to evaluate the student's performance and to arrive at a consensus about 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 Steering Committee. The chairperson cannot tell the student at this time whether or not s/he will be able to continue in the program, which is based on additional factors.

Soon after all the first-year oral examinations have been completed, the Biophysics Program Steering Committee will meet to hear the reports from the examining committees and to examine the records (course work, rotation evaluations, etc.) of each student. Based on these discussions, the Steering Committee will determine whether a student should remain in the program, be re-examined on a new paper (by the same preliminary exam committee or by a different one), or in unusual cases, leave the program. The decision of the Steering Committee 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 one's own knowledge and as a means of learning how to convey effectively that knowledge to others. Each (non-M.D./Ph.D.) biophysics student is required to act as a teaching assistant for at least one semester. Usually, this will be during the second year.

G. Selection of a Thesis Advisor

After completing three research rotations (usually at the end of May), passing all courses (as stated above), and successfully passing the first-year examination, students may submit in writing their choice for thesis advisor to the Graduate Studies Coordinator. Every attempt will be made to place students in their first-choice laboratory, but limitations of space and funding may, in some 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, s/he 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 Steering Committee of the BSCB Program.

The research advisors currently in the BSCB program are: Andrew Berger, Paul Boutz, Kara Bren, Regine Choe, Mark Dumont, Dmitri Ermolenko, Sina Ghaemmaghami, Alan Grossfield, Jeffrey Hayes, Paul Kammermeier, Clara Kielkopf, Todd Krauss, David MacLean, Lynne Maquat, David Mathews, David McCamant, James McGrath, Anne Meyer, Benjamin Miller, Joshua Munger, Mitchell O'Connell, Eric Phizicky, Lewis Rothberg, Gaurav Sharma, Juilee Thakar, Eric Wagner, Rick Waugh, Joseph Wedekind, Andrew White, Axel Wismüller and David Yule.

The BSCB program provides a broad array of opportunities for graduate education in the areas of biophysics, structural biology, and computational biology. Students in the BSCB program are free to choose any of the faculty advisors within the BSCB 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 BSCB 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. In this situation, the student would no longer be capable of pursuing a Ph.D. in Biophysics. A second option is to appoint the chosen advisor to the BSCB program as a member. This process requires formal approval by the steering committee and the existing BSCB

members. Under these circumstances, the student may remain in the BSCB program under the supervision of the chosen advisor.

Conditions under which a thesis advisor can resign. A faculty advisor may resign as the advisor of a student because they believe 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 BSCB Program and the Dean of Graduate Studies and Postdoctoral affairs to obtain approval. The Director will consult with the members of the Steering Committee to obtain approval. The purpose of this consultation is to seek a resolution to the issue(s) that are leading to the advisor resigning. The student must be given 60 days warning in writing before termination of the student stipend. The student may attempt to find a new research advisor during this period; if a BSCB 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. The thesis advisory committee serves the student by providing additional mentoring to that provided by the thesis advisor. It could 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 faculty member selected by the BSCB Education Chair, serve on the committee for the Qualifying Examination. Finally, the student's chosen committee members, along with a representative appointed by the Dean's Office, compose the examining committee for the final thesis defense. By September 30th of the second year, the student and the research advisor must submit a list of suggested committee members to the program administrator. The Program Director must approve this thesis advisory committee.

The thesis advisory committee must have a minimum of four members, including the thesis advisor, at least one member who is a faculty member in the Biophysics Program, one faculty member of the "primary" faculty in the Department of Biochemistry and Biophysics who is also a mentor in the BSCB program (see appendix), one faculty member from "outside" the Department and Program (who, by University rules, can also be a faculty member at another university) and a 4th member who can be primary or outside. The advisor will be either: 1. a mentor in the Biophysics Program or 2. member of the "primary" faculty in the Department of Biochemistry and Biophysics (see appendix, this person must also be a mentor in the BSCB Program). At least one member of the advisory committee must 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. The minimum size of the committee will be four members, but five (or more) is possible. Finally, when choosing a committee, each member must be informed that they will need to attend the student's yearly meetings (as stipulated below), which will last 1 h or more.

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 satisfy the uniform standards required for accreditation of the doctoral program 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 held immediately following 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. When scheduling a meeting, students should request that members be available for at least 1 h or possibly more.

At the end of the annual thesis committee advisory meeting, the thesis advisor will leave the room to give the student an opportunity to meet privately with the remaining members of the thesis committee. Additionally, thesis committee members who are family members with the advisor will also leave the room. This will give the student the opportunity to obtain mentoring from his or her committee in the absence of the advisor. The thesis committee members will be responsible for following up on any concerns raised by the student during this time. The graduate program director or the Chair of Biochemistry & Biophysics will help to resolve any concerns, as needed.

IV. QUALIFYING EXAMINATION PROCEDURES

A. General Description and Timeline

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, as well as the capacity for exploring a relevant problem in a scientifically sound manner. A rubric for the exam is available in the Appendix at the end of the handbook.

The timeline for the examination as stipulated by the School of Medicine and Dentistry requires completion before the start of the fifth semester of study.

The Qualifying Examination will be carried out by the thesis advisory committee and a member appointed by the Education Chair who will replace the student's thesis advisor for the examination. The advisor will not be present at the examination.

The examination is comprised of written and oral components. Because a career in science will undoubtedly involve submission and defense of research proposals (whether in an academic or industrial setting) the use of a modified NIH grant proposal format is required as described below.

Students must have completed a minimum of 24 hr of course work credit, as outlined above, at the time of the Qualifying Exam. The completed qualifying exam research proposal must be submitted to each member of the thesis advisory committee and to the Graduate Studies Coordinator (or proxy thereof) at least 10 business days before the day of the examination. The coordinator's copy must be emailed. Copies for committee members are generally on paper, although an electronic copy is acceptable if requested by the committee member. The Qualifying Exam must be completed by October 1st at the beginning of the third year of graduate study.

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

B. Scheduling Procedure

1. Schedule your Qualifying Examination with committee members and the faculty member appointed to the exam committee a minimum of 7-8 weeks prior to the exam. Once you have polled your faculty for their availability and a date/time/location has been set, all students are advised to get confirmation from the committee members to assure it has been added to their calendars. The office staff does not send out reminders to your Qualifying Exam committee members.
2. At least 6 weeks prior to the exam, inform the Graduate Studies Coordinator of the chosen date and time of the exam, confirm with all committee members and schedule a room. At least 25 business days prior to the exam, submit the title and abstract (30 lines of text maximum using font and margin guidelines in Section IV D) via email to the Graduate Studies Coordinator. The Coordinator will complete the necessary paperwork and submit it to the Registrar.
3. Submit a copy of the proposal to each committee member and the Graduate Studies Coordinator a minimum of 10 business days before the exam. Late proposals will not be accepted. A late proposal will be considered a fail on the written proposal.

The annual Research Review form cannot be completed at the time of the Qualifying Exam because the Ph.D. advisor is not present. The Research Review should be completed after the student's annual seminar. **Note:** The chair of the Qualifying Exam Committee will be appointed by the Senior Associate Dean for Graduate Education. Although notification of the exam will be sent to committee members by the Registrar, the student is encouraged to remind the committee members by email at least 24 hours prior to the oral examination; provide the time and location.

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: 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. Most 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 a format similar to an NIH R01 grant application as described below in section D.

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 the ability to develop a plan of experimentation that solves important problems in that research area. **Thus, it is an absolute requirement that the student alone devises the overall goals of the proposal (the Specific Aims) and that s/he designs the specific experiments to achieve those Aims.** During the proposal-writing course, students will receive extensive feedback primarily centered on writing style and the elements of writing a logical proposal. Occasionally, a "fatal flaw" in an experiment may be pointed out, or the need for additional justification (or experimentation) will be discussed. Likewise, students may ask peers and their advisor to provide comments on writing style, logical flow, and details of experimental techniques.

D. Qualifying Examination Research Proposal Format

The format of the qualifying exam follows the National Institutes of Health R01 grant application format. Page lengths are based on standard, single-spaced pages. Use 11 point Arial, Helvetica, Palatino, Linotype, or Georgia fonts with 0.50 inch margins at the top, bottom and sides. **Do not exceed 1 page for the Specific Aims and 12 pages** for sections ii-iv, including figures (inserted with figure legends in boxes throughout the text). A new page with the heading "References" should be included as additional pages, and does not count in the page limits. No Appendices will be considered. Guard against plagiarism as described above. Label the top of each page with your name in the header. Include a centered page number at the bottom of each page. A face page should be included with: the title of your proposal, your name, the date of the oral exam, exam location (or Zoom link), and your Ph.D. advisor's name. ***The face page does not count in the page limit***.

Qualifying exam proposals that do not follow this format will be rejected without review, similar to NIH policy. The qualifying exam will be postponed until the proposal is revised to meet the format requirements.

The pages of the proposal should have the following headings:

i. Specific Aims: State concisely and realistically what the research described in the proposal is intended to accomplish including what hypothesis will be tested, or what question will be answered. Do not exceed one page.

ii. 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 your proposal by relating the specific aims to longer-term objectives. Students need to state the "*rigor of prior research*" (see https://grants.nih.gov/grants/guide/notice-files/NOT-OD-18-228.html). Address the following "*Describe the strengths and weaknesses in the rigor of the prior research (both published and unpublished) that serves as the key support for the proposed project*." Also see: https://public.csr.nih.gov/FAQs/ApplicantsFAQs/PremiseRigorSexBiologicalVariable. This should be developed in the approach as well.

It is recommended that the entire section not exceed 0.5-2 pages.

iii. Innovation: This section should place the proposed work in the context of previous work in the field and emphasize the novel approaches and outcomes. Describe new methodology and its advantage over existing methodology. Innovation should also be described in terms of conceptual innovation. For example, a concept can be innovative but the experimental approach may be standard. It is recommended that this section not exceed one paragraph or a series of bullet points on the conceptual or experimental innovations of the proposal.

iv. Approach: This section should outline the work accomplished by the student and the proposed work. The qualifying examination is not intended as an assessment of the amount of data the student has acquired. However, available preliminary data should be included as evidence of feasibility for the proposed experimental plan. Next, the overall strategy to address the specific aims and the experimental design should be discussed. Describe the protocols to be used in broad terms, and provide tentative timetable for the overall investigation. A suitable experimental design will describe plans to incorporate scientific rigor and transparency, as well as biological variables as necessary; e.g., see https://grants.nih.gov/grants/RigorandReproducibilityChart508.pdf. Include a discussion of the possible results of the proposed experiments and how each result will be interpreted (i.e. state the specific criteria for success). Discuss the potential difficulties and limitations of the proposed procedures and suggest alternative approaches to achieve the aims. There is no page limitation for this section, but stay within the confines of the 12 page limit for sections ii-iv; make every attempt to be concise. You can neglect Authentication, which is a separate section of an R01 application. However, you must be aware of what it is and why it is

important to authenticate your reagents, source code, and other research resources.

v. References: Use a standard journal format that includes all authors, the year, the title of the article, the journal, volume and pages numbers.

E. Oral Qualifying Examination Format

The student is expected to prepare an overview of the thesis research proposal that should last no longer than 25 min (i.e., no more than 30 slides). This oral presentation can be conducted using complementary information placed on a blackboard, transparencies displayed on an overhead projector or a computer linked to a video projector. The student should anticipate interruptions during the presentation to allow the committee to examine the student orally. A typical examination will take between two to 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 can be raised about related areas.

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 s/he 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 Coordinator, who will inform the Director of Graduate Studies. All committee members will fill out the rubric form at the conclusion of the oral exam, and this rubric will frame the discussion about whether the student passed. The rubrics will be provided to the Graduate Studies Coordinator and be available to the thesis advisor.

If the student passes pending modifications to the thesis proposal, he/she will be given 14 calendar days after the exam to make the necessary revisions.

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

V. THESIS PREPARATION AND REGISTRATION

A booklet entitled " PREPARING YOUR THESIS: A MANUAL FOR GRADUATE STUDENTS" is available on-line at:

http://www.rochester.edu/Theses/ThesesManual.pdf

In addition, the "Guidelines for the Content of a Basic Science Ph.D. Thesis" is included in the Appendix of this handbook and is also posted online at:

https://www.urmc.rochester.edu/education/graduate/trainee-handbook/academic-resources/documents/smd-bs-thesis-guide-supplement.pdf

It is the responsibility of the student to ensure that style, format, margins, paper, binding, et cetera 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. It will usually take at least three months to prepare the thesis after all experimental work is complete. The most common mistake is in not allowing adequate time for the preparation of the document, including writing, illustrations, and formatting, which leaves insufficient time for proper review by the advisor. This can lead to rejection of the dissertation by the thesis advisory committee and insufficient time to register the document with the Graduate Dean's Office. In short, plan ahead.

The student's thesis advisory committee must approve the writing of the Ph.D. thesis at a formal committee meeting six months before the defense, at which time a Thesis Approval Form (see appendix) will be signed by all committee members to indicate their approval to begin writing the thesis. The Chair Nomination form (see appendix) must be completed by the Graduate Studies Coordinator four - six months prior to the exam.

Registration with the office of the Dean of Graduate Studies must take place at least 10 business days before the final exam.[i] In preparation for registration, the student should begin the process by meeting with the Graduate Studies Coordinator when first discussing a defense date with the Ph.D. advisor and thesis advisory committee. The approval/paperwork process starts at least 6 months before registration with the following steps:

1. 6 months prior to the thesis defense, the student must obtain written approval from their committee members to start working on their thesis. All members of the committee must sign the Thesis Approval form that can be obtained from the Graduate Studies Coordinator. It is recommended that this form be signed at a committee meeting.
2. At least 4 - 6 months in advance of scheduling the defense, the student must turn in the 3 Chair names along with a thesis title page and abstract to the Graduate Studies Coordinator. The Graduate Studies Coordinator will then complete the Chair Nomination form. The 3 potential chairs must meet specific criteria so please meet with the Graduate Studies Coordinator to discuss the process. From there, the Senior Associate Dean of Graduate Education will select a Chair for the defense. The chair, student, PI and

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Credit hours will be determined based on other courses taken in this semester.
dule of dates for the academic year. Final exams may not be scheduled during specific blackout periods

Graduate Studies Coordinator will be notified via email when a chair has been selected.

3. Once a chair has been selected and approved, the student can move forward with selecting the date and time for his/her defense. Once a date/time is selected, they should immediately contact the Graduate Studies Coordinator so that room reservations can be secured and a detailed email will be sent to the student to convey pertinent information. This must be at least 2 months prior to the defense to allow sufficient time to meet all deadlines as well as time to write and prepare for their defense. [ii]
4. At least 2 months prior to the defense date, the student should poll the thesis committee and defense chair to determine their preference for thesis format (hard copy or pdf).
5. At least 30 full business days prior to the defense, the student will need to provide the Graduate Studies Coordinator with the necessary information needed to create the SharePoint record.
6. At least 25 full business days prior to the defense, the student must provide the thesis to his/her thesis committee and defense chair to review in their preferred format. The version given at this time MUST be the same version given to the entire thesis committee and defense chair; no revisions can be made until after the thesis defense. The student will also need to meet with the Graduate Studies Coordinator to approve the SharePoint information and provide them with the required documentation.
7. At least 20 business days prior to the defense, the Graduate Studies Coordinator approves the SharePoint record and the SharePoint approval emails are sent to the thesis committee.
8. At least 15 full business days prior to the defense the thesis committee and Program Director must approve of the thesis submitted for defense via the SharePoint site (link provided in email sent from UnivGradStudies@UR.Rochester.edu).
9. At least 10 full business days must elapse between the registration date and the actual date of defense.
10. The school allows 60 calendar days after the defense date for submission of the final copy of the thesis via ProQuest. However, defenses schedules later in the semester will be subject to a deadline date that may be shorter than 60 days. Please consult the academic calendar for these deadline dates.

VI. FINAL EXAMINATION AND TERMINATION

Before the exam, the student's thesis advisor will receive confirmation of the exam schedule.

[ii] If the examination takes place during Fall or Spring semester, avoid scheduling the examination on a Tuesday, Wednesday or Friday afternoon.

The format of the Final Examination is as follows. The first hour of the exam is a seminar sponsored by the Department and open to the academic community. The student's presentation should last 50 minutes with 10 additional minutes allocated for questions from the audience, usually following the candidate's acknowledgments. A computer presentation, as well as any other notes, slides, charts, and usual visual aids are permitted for this open session. The student and the examining committee will then adjourn to a private (closed) session where they will conduct the second part of the exam. Using oral interrogation, the committee will scrutinize the student's comprehension, execution, description, interpretation and conclusions that are reported in the thesis. The student is encouraged to bring a copy of their thesis to the defense for their own reference.

After successful completion of the Final Examination and after making any required corrections in the thesis, the student must electronically submit a corrected copy of the thesis via SharePoint. The student is also expected to completed the UR Research Authorization form, provide the Graduate Studies Coordinator with an updated post defense Curriculum Vitae (C.V.), one tape bound copy of the final thesis needs to be submitted to the Department office and an electronic version of the Department Termination Form must be emailed to the Graduate Studies Coordinator. Students are required to turn in their lab key(s) and student ID on their termination date to the Department office.

The student will have exit interviews with the Dean of Graduate Studies and Postdoctoral affairs and with the Program Director. These are opportunities to provide feedback on the graduate program.

The termination date will determine when the stipend payment will cease. The student should discuss this with his/her advisor and share this information with the Graduate Studies Coordinator.

VII. POLICY REGARDING PLAGIARISM

Plagiarism is an extremely serious ethical 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 a defense for violations.

Plagiarism is defined and explained by the following statement, which is adapted from **http://ori.hhs.gov/ori-policy-plagiarism**.

"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 that 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 that you could not and did not arrive at by yourself) must be given in the form of footnotes or clear citation 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 without specific in-text references 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, such as the submission of prior answers from past students or the obtaining of information from other students while an examination is in progress [also] constitutes plagiarism."

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: Advisors are usually responsible for travel support. Travel awards are also available through the Graduate Student Society, Graduate Women in Science (GWIS), T32 Training Grants, or professional societies. Other departmental travel awards include: the Neuman Travel Award, and the Sayeeda Zain Travel Award.

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 policies state that fellows and trainees are expected to engage in full-time work and are entitled to official University Holidays (New Year's Day, Memorial Day, 4th of July, Labor Day, Thanksgiving Day, the Friday following Thanksgiving Day, and Christmas Day). The School of Medicine allows a two-week vacation period per year in addition to these holidays. **Academic Semester breaks are not considered holidays** (see the SMD Academic Calendar) and any absence during those times must be approved in advance (see below). The Department must submit monthly time reports on all graduate students and these are subject to close scrutiny by auditors from both the University and governmental accounting offices. **Thus, every student should inform his or her advisor of *any* absence, and an absence of more than one week must be approved by both the Graduate Studies Coordinator and the Ph.D. advisor *at least one month in advance*. In addition, international students must follow procedures set by the International Services Office (ISO). Students are not eligible to receive stipend support if they are absent without authorization.**

IX. PROGRAM AWARDS

Upon recommendation of the Program faculty, and the student's C.V., the Program Director will convene a committee to evaluate each student nominee for the following awards:

The **Leon L. Miller Fellowship** is awarded yearly to an outstanding Ph.D. student who shows outstanding promise for achievement in academics and research.

The **William F. Neuman Award** is awarded yearly to an outstanding Ph.D. student for academic, scientific and personal qualities that 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.

The **Biophysics Student Travel Award** is awarded to one or more meritorious students seeking to present their original research at a national or international meeting. In addition, such an award will be considered for students who need to travel to remote locations to collect data on specialized instrumentation. Financial need is a consideration.

X. GUIDELINES ON THE USE OF ARTIFICIAL INTELLIGENCE

According to the preeminent scientific journal *Nature* [*Nature* **613**, 612 (2025)], "*research must have transparency in methods, and integrity and truth from authors. This is, after all, the foundation that science relies on to advance.*" The BSCB Program and faculty mentors subscribe to this viewpoint. A major ethical concern is that trainees will claim credit for written text that is not their own, which is a form of plagiarism. Accordingly, the BSCB program does not allow any text submitted for course work or exams to be produced by AI. The BSCB program also prohibits the use of such approaches to generate or manipulate images, figures, or graphs without attribution. Use of AI in scientific research requires the consent of the PI and attribution, and requires journal approval when published. Any violation of this policy will be considered misconduct.

XI. EMERGENCY OR TEMPORARY CLOSINGS AND OTHER CHANGES IN CLASS SCHEDULES AND UNIVERSITY OPERATIONS.

The University plans to commence and conclude classes on the dates indicated in the academic calendars. But unforeseen circumstances or events may occur that require the University to temporarily close or otherwise adjust its student life, residential housing, class

schedules and format, method and location of instruction, educational activities, and operations because of reasons beyond the University's control. For example, such circumstances or events may include but are not limited to inclement weather, the onset of public health crises, being subject to government order(s), significant safety or security concerns, faculty illness, strikes, labor disturbances, sabotage, terrorism, war, riot, civil unrest, fire, flood, earthquake, acts of God, malfunction of University equipment (including computers), cyberattacks, unavailability of particular University facilities occasioned by damage to the premises, repairs or other causes, as well as disruption/unavailability of utilities, labor, energy, materials, transportation, electricity, security, or the internet. If any of these or other unforeseen circumstances or events outside of the University's control occur, the University will respond as necessary and appropriate, and it assumes no liability for any interruption or adjustments made to student life, residential housing, class schedules and format, method and location of instruction, educational activities, and operations caused by these or other unforeseen circumstances or events. And the University shall not be responsible for the refund of any tuition or fees in the event of any such unforeseen circumstances or events, except as may otherwise be expressly provided in the University's Leave of Absence and Withdrawal Policy or its published tuition refund schedule available online at: [https://www.rochester.edu/adminfinance/bursar/payments-and-refunds/payments-and-refunds/]

APPENDIX

2025-24 Academic Calendar

Department of Biochemistry and Biophysics Faculty

BSCB Program Faculty

Course Descriptions

Forms:

- Research Rotation Evaluation
- Annual Ph.D. Student Evaluation / Progress Report
- Rubric
- Qualifying Exam Rubric
- Thesis Approval Form
- Chair Nomination Form

Guidelines for the Content of a Basic Science Ph.D. Thesis

PLEASE NOTE: Your street address should be kept current with:

- Graduate Education and Postdoctoral Affairs – http://www.rochester.edu/its/acs/oge_address_form.html
- Department office – send an email to Marianne Arcoraci with the change

International students also must change their address with:

- ISO/Government – http://www.iso.rochester.edu/study/enrolled/address.html
- Glacier Records

University of Rochester

2024-2025 Academic Calendar

(School of Medicine and Dentistry – Graduate Programs)

Fall 2024	
August 26 (Monday)	Classes Begin
September 2	Labor Day (No Classes)
September 9	Last day to add/drop courses in *without* permission from course director
September 23	Last day to add/drop courses with permission from the course director and last day to request courses be changed to an audit status
September 24	First day to Withdraw ("W") from a course
October 14 - 15	University Fall Break (**NOT** a break for Graduate Students)
November 11	Last day to Withdraw ("W") from a course
November 27 - December 1	Thanksgiving Recess
December 2	Classes Resume
December 9	Last Day of Class
December 10 - 12	Reading Days
December 13 - 18	Final Exams
December 27	Final Grades Due
Spring 2025	
January 21 (Tuesday)	Classes Begin
January 24 (Friday)	Rochester "Monday" – all students attend Monday classes
February 3	Last day to add/drop courses in *without* permission from course director
February 17	Last day to add/drop courses with permission from the course director and last day to request courses be changed to an audit status
February 18	First day to "W" from a course
April 14	Last day to Withdraw ("W") from a course
March 8 - 16	University Spring Break (**NOT** a break for Graduate Students)
May 2	Last Day of Class
May 3 - 5	Reading Days
May 6 - 11	Final Exams
May 15 (Thursday)	Final Grades Due
May 16 - 18	Commencement Weekend
Summer 2025	
May 19 – August 1	Full Summer Session
May 26 (Monday)	Memorial Day Observed (No Classes)
June 19 (Thursday)	Juneteenth Observed (No Classes)
July 4 (Friday)	Independence Day Observed (No Classes)

Created: March 2024

Department of Biochemistry and Biophysics – Primary Faculty

Faculty	Interests
 Paul L. Boutz, Ph.D.	Regulation of pre-mRNA splicing and polyadenylation in healthy and diseased states; the contribution of RNA processing to cancer biology; effects of small molecule drugs on RNA processing and gene expression
 Mark Dumont, Ph.D.	Signal transduction; membrane protein structure, yeast molecular biology
 Dmitri Ermolenko, Ph.D.	Structural dynamics of the ribosome and ribosomal ligands during proteins synthesis, regulation of protein synthesis by mRNA structure in normal and diseased cells, and mechanisms of antibiotic action
 Elizabeth Grayhack, Ph.D.	Role of the genetic code in regulating protein synthesis and mRNA metabolism in *Saccharomyces cerevisiae*
 Alan Grossfield, Ph.D.	Investigating membranes and membrane proteins via computer simulation
 Jeffrey Hayes, Ph.D. (Chair)	Regulation of transcription, nuclear processes, related to chromatin structure and function
 Clara Kielkopf, Ph.D.	Splicing defects in hematologic malignancies; roles of human pre-mRNA splicing factors in HIV-1 infectivity; development of engineered splicing factors for correction of splicing defects; splice sites and their associated proteins as therapeutic targets
 Lynne Maquat, Ph.D.	RNA metabolism in human cells (nonsense-mediated mRNA decay/mRNA surveillance); influence of pre-mRNA splicing on mRNA translation; Staufen-mediated mRNA decay and Staufen-regulated RNA metabolism; post-transcriptional gene control via lncRNAs and SINEs; miRNA metabolism; Fragile X Mental Retardation Syndrome/Autism; therapeutics of nonsense diseases

Faculty	Interests
 David Mathews, M.D., Ph.D.	Computational biology of RNA, including structure prediction, molecular dynamics, and genomics
 Joshua Munger, Ph.D.	Mechanisms of metabolic network manipulation induced by viral infection and oncogenic mutation
 Mitchell O'Connell, Ph.D.	Biochemical mechanisms of RNA-mediated gene regulation; RNA-targeting CRISPR tool development
 Eric Phizicky, Ph.D.	tRNA biogenesis, function and quality control; intellectual disability due to deficiencies in tRNA modifications
 Eric J. Wagner, Ph.D.	Mechanism and physiological importance of alternative polyadenylation; Integrator Complex and transcriptional control, development and application of next-generation sequencing technologies
 Joseph Wedekind, Ph.D.	Structure and function analysis of gene regulation by non-protein-coding (nc) RNAs as a basis for therapeutic development
 Yi-Tao Yu, Ph.D.	RNA modification; pre-mRNA splicing; snRNP biogenesis; telomerase RNA modification and aging; nonsense-disease therapeutics

Biophysics, Structural and Computational Biology (BSCB) Faculty

Faculty	Interests
 Andrew Berger, Ph.D. Professor, Optics	Biomedical optics, specifically spectroscopic diagnostic techniques
 Paul Boutz, Ph.D. Assistant Professor, Biochemistry & Biophysics	Regulation of pre-mRNA splicing and polyadenylation in healthy and diseased states; the contribution of RNA processing to cancer biology; effects of small molecule drugs on RNA processing and gene expression
 Kara Bren, Ph.D. Professor, Chemistry (Chair)	Bioinorganic and Biophysical Chemistry of Metalloproteins
 Regine Choe, Ph.D. Asscoiate Professor, Biomedical Engineering	Diffuse optics for *in vivo* cancer detection, diagnosis and therapy monitoring
 Mark Dumont, Ph.D. Professor, Biochemistry & Biophysics	Signal transduction; membrane protein structure, yeast molecular biology
 Dmitri Ermolenko, Ph.D. Professor, Biochemistry & Biophysics	Structural dynamics of the ribosome and ribosomal ligands during proteins synthesis, regulation of protein synthesis by mRNA structure in normal and diseased cells, and mechanisms of antibiotic action.
 Sina Ghaemmaghami, Ph.D. Professor, Biology	Molecular mechanisms of prion propagation and pathogenesis
 Alan Grossfield, Ph.D. Associate Professor Biochemistry & Biophysics	Investigating membranes and membrane proteins via computer simulation
 Jeffrey Hayes, Ph.D. Professor & Chair, Biochemistry & Biophysics	Regulation of transcription, nuclear processes, related to chromatin structure and function

Faculty	Interests
 Paul Kammermeier, Ph.D. Associate Professor, Pharmacology & Physiology	G protein coupled receptor signaling and modulation of ion channels in neurons
 Clara Kielkopf, Ph.D. Professor, Biochemistry & Biophysics	Splicing defects in hematologic malignancies; roles of human pre-mRNA splicing factors in HIV-1 infectivity; development of engineered splicing factors for correction of splicing defects; splice sites and their associated proteins as therapeutic targets
 Todd Krauss, Ph.D. Professor, Chemistry	Understanding the fundamental properties of materials with a size in between individual molecules and macroscopic objects
 David MacLean, Ph.D. Associate Professor, Pharmacology & Physiology	Mechanisms of neurotransmitter receptor function
 Lynne Maquat, Ph.D. Professor, Biochemistry & Biophysics	RNA metabolism in human cells (nonsense-mediated mRNA decay/mRNA surveillance); influence of pre-mRNA splicing on mRNA translation; Staufen-mediated mRNA decay and Staufen-regulated RNA metabolism; post-transcriptional gene control via lncRNAs and SINEs; miRNA metabolism; Fragile X Mental Retardation Syndrome/Autism; therapeutics of nonsense diseases
 David Mathews, M.D., Ph.D. Professor, Biochemistry & Biophysics	Computational biology of RNA, including structure prediction, molecular dynamics, and genomics
 David McCamant, Ph.D. Associate Professor, Chemistry	Ultrafast Spectroscopy and Photophysics
 James McGrath, Ph.D. Professor, Biomedical Engineering	Cell Motility and Quantitative light microscopy

Faculty	Interests
 Anne Meyer, Ph.D. Associate Professor, Biology	Bacterial stress response; 3D printing of bacteria; Biomaterials
 Benjamin Miller, Ph.D. Professor, Dermatology	Carbohydrate and protein recognition, molecular design, and biomolecular sensing
 Joshua Munger, Ph.D. Professor, Biochemistry & Biophysics	Mechanisms of metabolic network manipulation induced by viral infection and oncogenic mutation
 Mitchel O'Connell, Ph.D. Associate Professor, Biochemistry & Biophysics	Biochemical mechanisms of RNA-mediated gene regulation; RNA-targeting CRISPR tool development
 Eric Phizicky, Ph.D. Professor, Biochemistry & Biophysics	tRNA biogenesis, function and quality control; intellectual disability due to deficiencies in tRNA modifications
 Lewis Rothberg, Ph.D. Professor, Chemistry	Organic electronics, Plasmon-enhanced spectroscopy and biomolecular sensing
 Gaurav Sharma, Ph.D. Professor, Electrical & Computer Engineering	Computational biology of RNA; RNA comparative sequence analysis; RNA structure prediction; analysis of HIV RNA genomes
 Juilee Thakar, Ph.D. Associate Professor, Microbiology & Immunology	Systems approach utilizing bioinformatics, and dynamic modeling tools to study immune response to infections and vaccination
 Eric Wagner, Ph.D. Professor, Biochemistry & Biophysics	Mechanism and physiological importance of alternative polyadenylation; Integrator Complex and transcriptional control, development and application of next-generation sequencing technologies

Faculty	Interests
 Richard Waugh, Ph.D. Professor & Chair, Biomedical Engineering	Cell Adhesion, Mechanical and thermodynamic properties of biological membranes; cellular mechanics and function of cytoskeletal proteins
 Joseph Wedekind, Ph.D. Professor, Biochemistry & Biophysics	Structure and function analysis of gene regulation by non-protein-coding (nc)RNAs as a basis for therapeutic development
 Andrew White, Ph.D. Associate Professor, Chemical Engineering	Uses experiments, molecular simulations and machine-learning to design new materials
 Axel Wismüller, M.D. Ph.D. Professor, Imaging Sciences	Intelligent image acquisition and analysis systems in biomedicine
 David Yule, Ph.D. Professor, Pharmacology & Physiology	Mechanisms Underlying Ca2+ Signaling Events in Exocrine Cells

BSCB Elective Courses

Fall 2024

BCH 521 BIOINFORMATICS FOR LIFE SCIENTISTS (4)

This course will teach scripting in Python and also algorithm design for bioinformatics. It expects no prior knowledge in programming. The class will meet twice a week – once for a traditional lecture and once for a laboratory session.

BIO 402 MOLECULAR BIOLOGY (4)

This course deals with the molecular mechanisms of DNA replication, DNA repair, transcription, translation, and control of gene expression. We will also discuss cell cycle regulation, programmed cell death, molecular basis of cancer, and modern molecular biology techniques. Emphasis will be given to mammalian systems and molecular mechanisms of human diseases.

BPH 592 SPECIAL TOPICS IN BIOPHYSICS - MATH FOR MOLECULAR BIOPHYSICS

Periodic motion, waves, Fourier Series and complex representation, partial differential equations, waves, scattering, vector analysis, Fourier transforms, delta functions, electromagnetism, Maxwell's equations, forces, analysis of molecular structure, Least squares fitting, cat scans, back Projection, spin, angular momentum, magnetic moment, MRI, laboratory statistics.

CHM 423 NMR SPECTROSCOPY (2)

(Formerly CHM 422) An introduction to NMR spectroscopy. Collection, processing, and interpretation of homonuclear and heteronuclear 1D and multidimensional spectra will be covered. Topics to be discussed include chemical shifts, relaxation, and exchange phenomena. Examples from organic, inorganic, and biological chemistry will be used. (Fall, 1st half of semester).

CHM 451 QUANTUM CHEMISTRY I (4)

Advanced quantum chemistry. This course aims to provide access to quantum aspects of modern physical chemistry research. Topics include: Mathematical tools in quantum mechanics (as required), Dirac ket notation, entanglement, measurement theory, Ehrenfest Theorem, wave packets, 1st and 2nd quantization, spin and orbital angular momentum, density matrix, harmonic oscillator, electronic, rotational and vibrational spectroscopy, approximation methods (stationary and time dependent perturbation theory, WKB), systems of N identical particles, correlation functions, scattering and transfer, quantum informatics. Regular problem sets. M/W/F 9:00 - 9:50 a.m. Midterm and Final exams.

CHM 469 COMPUTATIONAL CHEMISTRY (4)

In this course students will learn about a range of computational methods that is relevant to their research problems in chemistry. Emphasis will be placed both on the theory underlying computational techniques and on their practical applications. Topics will include molecular mechanics, molecular dynamics and Monte Carlo simulations, methods for free-energy calculations. (Fall, first 1/2 of semester)

MBI 473 IMMUNOLOGY (3)

This lecture-based course will cover basic concepts in development and function of the immune system, including innate immunity and inflammation, adaptive T and B lymphocyte responses, immunity to infection, vaccination, tumor immunotherapy, transplantation, allergy, and autoimmunity. Small group meetings will be held weekly to discuss open-ended problems based on recent lectures. Students will be evaluated by three exams.

NSC 512 CELLULAR NEUROSCIENCE (5)

This course aims to provide students with an advanced understanding of the ionic, biochemical, molecular, and cellular properties of the nervous system. The course begins by discussing the electrical properties of neurons, the molecular properties of ion channels, and the functional organization of receptors and channels at the synapse. Subsequent lectures cover the molecular and cell biology of neurotransmission, including the major neurotransmitter/receptor systems, receptor-mediated signal transduction, and sensory transduction. The final section discusses the molecular and genetic processes that govern development of the nervous system.

PHP 403 HUMAN CELL PHYSIOLOGY (4)

This course is aimed at providing an introduction to the fundamental principles of stem cell biology, modern cell physiology, tissue and organ physiology, and intercellular communication. Initially the course will provide the implications of cellular and molecular principles for stem cell biology. Subsequently, the remainder of the course will focus on the integrated physiological responses and intercellular signaling of cells, tissue systems, and intact organs in both healthy and diseased states. The material will include basic concepts, principal research questions, and common methodologies - emphasis will be on a quantitative approach wherever possible. Critical reading and evaluation of recent literature relevant to each major topic will be an integral part of the course. This essential skill, key to the success of any burgeoning research scientist, will be thoroughly assessed through participation in the weekly “Paper” sessions.

Spring 2025

BCH 412 ADVANCED TOPICS IN BIOLOGICAL MACROMOLECULES (5)

An advanced biochemistry lecture course intended for senior undergraduate and graduate students. Topics include DNA structure, RNA structure and catalysis, nucleic acid-protein interactions, x-ray crystallography, NMR spectroscopy, protein folding, molecular chaperones, membrane proteins, post-translational modifications of proteins, ATPases, G protein and function, protein-protein interactions, proteases and cascade reaction pathways.

BME 442 MICROBIOMECHANICS WITH MICROFLUIDICS (4)

This course covers a range of topics in mechanics and biophysics essential to the practice of biomedical engineering at the smallest length scales. The course is taught in two parts. The first half focuses on basic principles such as diffusion and the physical and kinetic properties of biomolecules. This section ends with an integration of these concepts in the study of molecular machines in biology. The second half of the course focuses on microfluidics including basic theory, COMSOL modeling and microfabrication of devices. The course ends with each student building a unique microfluidic system with mentorship from faculty, staff or advanced graduate students. Enrollment is limited.

CHM 416 X-RAY CRYSTALLOGRAPHY (2)

Students will learn the basic principles of X-ray diffraction, symmetry, and space groups. Students will also experience the single crystal diffraction experiment, which includes crystal mounting, data collection, structure solution and refinement, and the reporting of crystallographic data. Weekly assignments: problem sets, simple lab work, or computer work. (2nd half of semester).

CHM 440 BIOORGANIC CHEMISTRY & CHEMICAL BIOLOGY (4) (even numbered years)

(Formerly CHM 437) An introduction to bioorganic chemistry and chemical biology. The course will present a survey of how the principles of organic chemistry have been applied to understand and exploit biological phenomena and address fundamental questions in life sciences. The course is primarily based upon the primary literature. Covered topics include the design and mechanism of enzyme mimics and small molecule catalysts (organocatalysts), synthesis and chemical modification of biomolecules (oligonucleotides, proteins, oligosaccharides), design and application of oligonucleotide and peptide mimetics, and chemical approaches to proteomic and genetic analyses. Not open to freshmen and sophomores.

IND 443 EUKARYOTIC GENE REGULATION (4)

This advanced course examines mechanisms of chromatin-mediated regulation of gene expression, relating molecular structures, dynamic interactions, nuclear processes, 3-D nuclear organization to biological functions. Topics include DNA structures, packaging and higher order chromatin organization in the nucleus, the transcription machinery, eukaryotic chromosome structure and its modifications, epigenetics and functional genomics, dynamics of nuclear processes, nuclear reprogramming, development and applications of genome manipulation technology. Lectures and readings draw heavily on primary literature both classic and most recent.

IND 447 SIGNAL TRANSDUCTION (4)

Cellular signal transduction is one of the most widely studied topics in the biomedical sciences. Cells have multiple mechanisms for sensing the environment and converting the external signals into intracellular responses that are important for regulation of human physiology. Dysregulation of these processes can result in disease and manipulations of these pathways are the basis for many therapeutics.

Rotation Evaluation Form (Faculty)

Please complete this form ***electronically*** and submit to the office of Graduate Education and Postdoctoral Affairs by the due date at the end of the form.

Student Name: Enter text. URID: Enter text.

Mentor Name: Enter text.

Program Name: Choose program MD/PhD Student? Choose an item.

Evaluation Date: MM/DD/YYYY Rotation Start Date: MM/DD/YYYY Rotation End Date: MM/DD/YYYY

Extent of your personal involvement in training: Choose an item. Recommended Grade: Choose an item.

Did the student meet rotation research report requirements via oral or written presentation? Choose an item.

Evaluation	Unacceptable	Needs Improvement	Meets Expectations	Exceeds Expectation
Ability to design experiments	☐	☐	☐	☐
Bench work (may not apply)	☐	☐	☐	☐
Analytical skills	☐	☐	☐	☐
Work ethic	☐	☐	☐	☐
Lab/research meeting participation	☐	☐	☐	☐
Background knowledge	☐	☐	☐	☐
Notebook	☐	☐	☐	☐
Attendance (in the lab or otherwise)	☐	☐	☐	☐
Attitude and intellectual involvement	☐	☐	☐	☐
Grasp of new concepts/self-sufficiency	☐	☐	☐	☐
Overall evaluation	☐	☐	☐	☐

Project Title/Description:

Enter text.

Faculty evaluation of student's strengths and weaknesses:

Comment on the student's strengths and weaknesses. In addition, comment on the quality of the student's written report (if one was required):

Enter text.

I have *HONESTLY* discussed with the student his/her performance during this rotation and provided constructive criticism. Choose an item.

Instructions for Evaluation Submission to the Graduate Education and Postdoctoral Affairs Office

The Lab Mentor completes the evaluation and emails the final document to the Graduate Program Coordinator and the Graduate Program Director by the appropriate due date below. The Graduate Program Coordinator will forward the document via email to:

- SMDGradEval@urmc.rochester.edu
- Student

Upon receipt of the email, the Graduate Education and Postdoctoral Affairs office assumes that this is the final evaluation and that all pertinent parties are in agreement. Thus, the email represents each party's signature and will be kept with the evaluation in the student file.

The form is due to the Graduate Education and Postdoctoral Affairs office on one of the following dates:

Rotation Begins	**Rotation Ends**	**Evaluation DUE**
October 1	December 15	December 20
January 1	March 15	April 1
March 16	May 31	June 15
July 1	August 31	September 15

SCHOOL OF MEDICINE & DENTISTRY
UNIVERSITY of ROCHESTER

Rotation Evaluation Form (Student)

Please complete this form **electronically** and submit by the due date at the end of the form.

Student Name:	Enter text.	URID:	Enter text.
Mentor Name:	Enter text.		
Program Name:	Choose program	MD/PhD Student?	Choose an item.

Evaluation Date:	MM/DD/YYYY	Rotation Start Date:	MM/DD/YYYY	Rotation End Date:	MM/DD/YYYY

My attendance (in the lab or otherwise) was:	Choose an item.
Have you been assigned background readings?	Choose an item.
Can you perform (execute) your own experiments?	Choose an item.
How much have you learned technically?	Choose an item.
Contact with mentor:	Choose an item.
Did your mentor keep commitments, appointments, etc.?	Choose an item.
Who did the bulk of the training?	Choose an item.
Did you get along with your mentor?	Choose an item.
Was your mentor a good rotation advisor?	Choose an item.
Did you rotation advisor discuss your rotation evaluation with you?	Choose an item.
Overall rating of rotation:	Choose an item.
Did this rotation meet your expectations?	Choose an item.

Please give a detailed description of your expectations for this rotation. Include any ways that your experience may have fallen short of, met, or exceeded these expectations.

Enter text.

Briefly describe the research project assigned for this rotation.

Enter text.

Describe what you believe the goals and duties were for this rotation.

Enter text.

Describe what you accomplished.

Enter text.

This form is confidential – it will not be shown to the faculty member unless you agree to disclosure.

☐ Yes, the contents of this form can be disclosed.

☐ No, the contents of this form should remain confidential in the Graduate Education and Department files.

Instructions for Evaluation Submission to the Graduate Education and Postdoctoral Affairs Office

- The student completes the evaluation and emails the final document to the Graduate Program Coordinator and the Graduate Program Director by the appropriate due date below. The Graduate Program Coordinator will forward the document via email to the following:
  - SMDGradEval@urmc.rochester.edu
- Upon receipt of the email, the Graduate Education and Postdoctoral Affairs office assumes that this is the final evaluation and that all pertinent parties are in agreement. Thus, the email represents each party's signature and will be kept with the evaluation in the student file.

This form is due to the Graduate Education and Postdoctoral Affairs office on one of the following dates:

Rotation Begins	**Rotation Ends**	**Evaluation DUE**
October 1	December 15	December 20
January 1	March 15	April 1
March 16	May 31	June 15
July 1	August 31	September 15

Annual PhD Student Evaluation/Progress Report

Student Name	Enter text.	Program Name	Choose program
ORCID iD	Enter text.	eRA Commons Username	Enter text.
URID	Enter text.	Entering Year YYYY	Today's Date MM/DD/YYYY
Evaluation Period Start Date	MM/DD/YYYY	Evaluation Period End Date	MM/DD/YYYY

Title of Research Project

Enter text.

INSTRUCTIONS FOR FORM COMPLETION

This form should be completed electronically. *Please provide information requested from the time you began the graduate program.*

Student Responsibilities:

- *Inform your program coordinator of your committee meeting date.*
- *Complete the top portion of this form and sections A-I.*
- *E-mail the completed form to your committee prior to the meeting.*

Advisor/Committee Responsibilities:

- *Complete section J of this form,* ***electronically****.*
- *Come to a consensus and finalize the document between the advisor, the committee members and the student.*
- *Within 1 week of the committee meeting, the Advisor emails the* ***complete and final*** *document to the Graduate Program Coordinator and Graduate Program Director. The Graduate Program Coordinator will forward the document via email to the student, all committee members, and to Graduate Education and Postdoctoral Affairs.*
- *Upon receipt of the email, the Graduate Education and Postdoctoral Affairs office assumes that this is the final evaluation and that the advisor, the committee members, and the student agree on the document's contents.*

The Advisor is ultimately responsible for the completion and submission of this form on an annual basis.

A. RESEARCH ACCOMPLISHMENTS (*from the time you began the graduate program, in chronological order)*

1. Meetings Attended: Provide names, dates and locations. Please indicate if there was a presentation. If so, provide the title and indicate if it was a poster or oral presentation.

Enter text.

2. Other Seminars/Presentations (include in-house)

Enter text.

3. Papers Published

Enter text.

4.a. Predoctoral Fellowships: Applications

Enter text.

4.b. Predoctoral Fellowships: Awarded

Enter text.

4.c. Predoctoral Fellowships: Planned

Enter text.

5. Honors/Awards Received

Enter text.

B. SERVICE AND OTHER ACTIVITIES (from the time you began the graduate program, in chronological order)

1. Teaching

Enter text.

2. University or Departmental Committees

Enter text.

3. Student Activities/Organizations (indicate if you held an office)

Enter text.

4. Clinical/Translational Experiences

Enter text.

5. Other Professional Activities Not Identified Above

Enter text.

6. Other Activities (community, etc.) With Professional Relevance

Enter text.

C. COURSEWORK

1. Remaining Required Courses

Enter text.

2. Courses Taken/Workshops Attended (*from the time you began the graduate program, in chronological order)*

Enter text.

3. Courses to be Taken Next Year

Enter text.

D. RESEARCH PROGRESS

1. Overall Objective of Research Efforts

Enter text.

2. Have the aims of your thesis proposal changed since your last progress report? If so, how?

Enter text.

3. Provide a brief summary of accomplishments prior to the current review period.

Enter text.

4. Provide a report of your research progress for the period covered by this report. Address the aims in your proposal as well as the goals stated in your last report (*1 page maximum*).

Enter text.

E. GOALS FOR THE NEXT PERIOD (define whether it is a 4-, 6-, or 12-month period and why)

Enter text.

F. CAREER GOALS

1. Current Career Goals

Enter text.

2. Have you started to search for a job/postdoctoral position? If no, when do you anticipate starting this search?

Enter text.

G. INDIVIDUAL DEVELOPMENT PLAN (IDP) EXPECTATION

It is expected that all SMD PhD students will create and maintain an IDP. IDPs should be revised and modified on a regular basis, no less than annually. There are many IDP tools available. Students may choose the type of IDP that works best for their needs.
Do you have an up-to-date IDP in place?

Choose an item.

If no, why not? When do you expect to create/update your IDP?

Enter text.

Have you discussed your IDP with your advisor and/or another trusted mentor? You are **strongly encouraged** to share your goals with your advisors and to communicate openly.

Choose an item.

H. ADDITIONAL STUDENT COMMENTS

Are there any additional concerns/issues that you would like to discuss with the committee?

Enter text.

I. COMMITTEE MEETING INFORMATION

Committee Meeting Date: MM/DD/YYYY

If no meeting occurred, please explain why.

Enter text.

Advisor's Name:	Enter text.
Committee Member 1 Name:	Enter text.
Committee Member 2 Name:	Enter text.
Committee Member 3 Name:	Enter text.
Committee Member 4 Name:	Enter text.
Committee Member 5 Name:	Enter text.

J. COMMITTEE REPORT

Is the student making satisfactory progress? Choose an item.

Please provide feedback on the student's progress, strengths and accomplishments. Aspects to address include research efforts and progress, intellectual growth, professional development, quality of the presentation and coursework requirements or suggestions.

Enter text.

Committee recommendations including future plans for research, research goals, suggested changes in the project, specific experimental suggestions, areas in need of improvement, career goals, etc.

Enter text.

Should the student meet with the committee at 6 months instead of 1 year?	Choose an item.
Anticipated month/year of PhD defense:	MM/YYYY
Please rate the student's progress for the period covered by this report:	Choose an item.

Instructions for Evaluation Submission to the Graduate Education and Postdoctoral Affairs Office:

- Come to a consensus and finalize document between the advisor, the committee members and the student.
- Within 1 week of the committee meeting, the Advisor emails the **complete and final** document to the Graduate Program Coordinator and the Graduate Program Director. The Graduate Program Coordinator will forward the document via email to:
    1. SMDGradEval@urmc.rochester.edu
    2. All Committee Members
    3. Student
- Upon receipt of the email, the Graduate Education and Postdoctoral Affairs office assumes that this is the final evaluation and that the advisor, the committee members and the student agree on the document's contents. Thus, the email represents each party's signature and will be kept with the evaluation in the student file.

Biophysics, Structural and Computational Biology Program End of First year evaluation: Rubric

Student: _____

Outcome/Assessment	Score	"Scoring" is based on the following system				
		Outstanding 4	**Very Good 3**	**Acceptable 2**	**Marginal 1**	**Not Achieved 0**
Fall semester grades	Grade:	Avg of 3.8 and above	Avg of 3.5-3.79	Avg of 3.0-3.49	Avg of 2.33-2.99, or one grade of C	Avg <2.33, or two grades of C
Spring semester grades	Grade:	Avg of 3.8 and above	Avg of 3.5-3.79	Avg of 3.0-3.49	Avg of 2.33-2.99, or one grade of C	Avg <2.33, or two grades of C
Rotation 1 Evaluation Mentor:	Score:	Mixture of "Meets Expectations" and "Exceeds Expectations"	All "Meets Expectations"	Mostly "Meets Expectations" but one "Requires More Effort" *	≤ 2 "Requires More Effort" *	At least one "Unacceptable" or the majority of metrics ranked as "Requires More Effort" *
Rotation 2 Evaluation Mentor:	Score:	Mixture of "Meets Expectations" and "Exceeds Expectations"	All "Meets Expectations"	Mostly "Meets Expectations" but one "Requires More Effort" *	≤ 2 "Requires More Effort" *	At least one "Unacceptable" or the majority of metrics ranked as "Requires More Effort" *
Rotation 3 Evaluation Mentor:	Score:	Mixture of "Meets Expectations" and "Exceeds Expectations"	All "Meets Expectations"	Mostly "Meets Expectations" but one "Requires More Effort" *	≤ 2 "Requires More Effort" *	At least one "Unacceptable" or the majority of metrics ranked as "Requires More Effort" *
Involvement in activities (e.g. attend lunch with seminar speakers, attend seminars, and attend student seminars)	Score:	Regularly	Often	Sometimes	Infrequently	Never *
Comments:						
Lab joined or to be joined:						

**Is there evidence that the faculty mentor communicated this with the student? In writing, orally, or both?*

If yes, see below. If no, then the Program Director will speak first with the faculty mentor for the rotation and request that they communicate concerns directly to the student, preferably in writing or both orally and in writing.

Follow up after first year student evaluations:

As per School policy, students who receive a 0 for coursework will be immediately dismissed from the program.

The program faculty meet in July each year to assess student performance in the first year. The evaluation of students considers the first year exam and the performance on the rubrics on this form. After assessing student performance, the faculty approve one of three courses of action: 1) student is invited to continue in the program by choosing a thesis advisor, starting thesis work, and preparing for the qualifying exam, 2) student is asked to retake the first year exam and the assessment is repeated, or 3) the student must leave the program.

The purpose of these rubrics is to communicate to students the criteria that are used to evaluate their first-year performance. Additionally, the quantitative score provides the means of objectively evaluating a student's performance in the first year. Finally, the scores and narrative of this form are used to focus the discussion of the faculty on student performance.

Biophysics, Structural, and Computational Biology
Ph.D. QUALIFYING EXAMINATION RUBRICS

Name of Student: _____ Exam Date: _____

Please give your evaluation on each of the following performance criteria. If insufficient basis is available for judgment, enter N/A (not applicable). Please use numerical rating of: **1 → 5**

guidelines: **5** = Outstanding
4 = Excellent
3 = Good (meets expectations)
2 = Additional practice needed
1 = Unacceptable in this area

Written Proposal **SUM (passing ≥ 24) =** (____)

1. Are the Specific Aims clear, concise, and do they summarize the proposed work? _____
2. Is the Significance scholarly and accurate? _____
3. Does the Innovation section specify aspects of the proposed work that are novel? _____
4. Are Preliminary Results (if included) interpreted meaningfully? _____
5. Does the student have a clear vision of the Research Plan as explained in the Approach? _____
6. Is the Research Plan reasonable with clear metrics for success? Are alternative approaches described? _____
7. Is the writing style clear, and do the figures clearly present concepts, data, and planned experiments? _____
8. Are the organization and logic of the document at the level of a Ph.D. candidate? _____

General Knowledge in Oral Exam **SUM (passing ≥ 6) =** (____)

1. Is the student familiar with basic concepts in the area of their project? _____
2. How familiar is the student with Biophysics concepts outside this area? _____

Oral presentation of Research Proposal **SUM (passing ≥ 24) =** (____)

1. Can the student explain the concepts that are central to the project? _____
2. Can the student explain the techniques and methods that are central to the project? _____
3. Does the student understand the significance and novelty of the specific project within a broader context? _____
4. Are the ideas and presentation clearly organized? _____
5. Is the student familiar with the literature precedents pertinent to the thesis? _____
6. Is the student able to think through responses to difficult questions? _____
7. Does the student show evidence of creative thought on the problem? _____
8. Can the student propose alternative solutions to the problem when faced with a (hypothetical) difficulty? _____

A passing exam requires a passing score for each of the three categories (Written Proposal, General Knowledge, and Presentation of Research Proposal).

A member of the exam committee, designated by the Education Chair, will provide a written summary of the exam performance including a discussion of strengths and weaknesses.

_____ _____ Please return to **Melissa Vera**
Faculty Name Signature immediately after exam.

BIOPHYSICS Ph.D. PROGRAM
Thesis Defense Approval Form

Student's Name _____

Date _____

Advisor _____

The following committee members have agreed and approve the above mentioned student to start writing his/her thesis.

Name (please print)	Signature
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

NOTE: The thesis defense approval form is strongly encouraged to be completed at a committee meetings 4-6 months prior to a planned defense date.

Please return to the Department Office.

SCHOOL OF MEDICINE & DENTISTRY
UNIVERSITY of ROCHESTER

Request for PhD Defense Chairperson

Name of Candidate:	Enter text.	URID:	Enter text.
Department:	Choose an item.		
For the Degree In:	Choose an item.		
Name of Advisor:	Enter text.		
Committee Members:	Enter text.	Enter text.	
	Enter text.	Enter text.	
	Enter text.	Enter text.	

The following ranked full-time faculty from **outside** the candidate's PhD department/program are **suggested to serve as chair** of the oral exam.

SMD Grad Dean Indicate Selection

Enter text. (1st Chair Nominee)	Enter text. (Dept. of Primary Appointment/Faculty Rank)	☐
Enter text. (2nd Chair Nominee)	Enter text. (Dept. of Primary Appointment/Faculty Rank)	☐
Enter text. (3rd Chair Nominee)	Enter text. (Dept. of Primary Appointment/Faculty Rank)	☐

Thesis Title: (***please note: an abstract of thesis work and program of study must also accompany this form)***

Enter text.

At the University of Rochester, a chairperson is appointed for each PhD oral defense exam to monitor and promote fairness and rigor in the conduct of the defense. The chair's status as *a nonmember* of the advisor's and student's department or program enables distance from previously established judgments on the candidate's work and prevents the chairperson from exerting administrative authority over other members or being subject to such authority. In the graduate programs within the School of Medicine and Dentistry, the program director (with input from the advisor/student when appropriate) nominates three faculty members to serve as chair. The nominations are reviewed by the Senior Associate Dean for Graduate Education and Postdoctoral Affairs and one faculty member is approved to chair the defense exam.

This form must be submitted to the Senior Associate Dean for Graduate Education and Postdoctoral Affairs to initiate the appointment of a doctoral defense chairperson
at least 4 months prior to scheduling a defense date. When scheduling for the defense, the approved chair is included in the student's planning for specific dates.

Program Director Signature Date

Senior Associate Dean Signature Date

Revised 12/2018

SCHOOL OF MEDICINE & DENTISTRY
UNIVERSITY of ROCHESTER MEDICAL CENTER

Guidelines for the Content of a Basic Science PhD Thesis

prepared by Dirk Bohmann and Eric Phizicky

1. Purpose of this document:

This document provides a summary of the expectations for the written content of a thesis; that is, it provides a guide for how a thesis should be structured for writing, and for the content that comprises a well written thesis.

This document is meant to be a supplement to the general guidelines of the University of Rochester for preparation of a thesis (THE PREPARATION OF DOCTORAL THESES: A MANUAL FOR GRADUATE STUDENTS), which can be found at the website: http://www.rochester.edu/Theses/ThesesManual.pdf, and which governs all theses at this university. Rather, the guidelines described here are meant to be a guide for the written content of the thesis.

2. Overview of thesis contents

A thesis is a description and interpretation of the research conducted by the candidate that qualifies him/her for the degree of PhD.

It is written for non-specialized scientists (not for the mentor!). Specifically, every member of the thesis examination committee, including faculty from other science departments, have to be able to read and understand everything that is included in the text without consulting secondary sources. Specialist terms need to be explained or avoided. Non-standard techniques have to be explained.

It is written in English with correct spelling and grammar. It is not the job of the committee to proof-read the text. Having the text of the thesis corrected and edited for clarity by a second person (mentor or otherwise) is acceptable and highly recommended. A committee member can refuse to accept a thesis with excessive grammatical or graphical errors.

There is no formal minimum or maximum length. The thesis has to give an in depth account of the background and scientific question addressed, as well as a detailed description of the conducted experiments, that is typically more specific than the published literature on the same work. Independent and original thought is welcome. An alliteration of published fact(oid)s with tangential relevance to the research topic (just to fill up pages) should be avoided.

3. Sections of the thesis

Title page

Abstract
-- Must be a maximum of 350 words.
-- Should contain no references, and no undefined non-standard abbreviations.

Acknowledgements
My boss rocks….. but I am glad to be out of here.. and I love my mother

Foreword
Although the thesis document can contain experimental data not generated by the candidate (for example those supplied by a collaborator or technician, if they are critical for the scientific argument), all such contributions must be specified in the foreword.

Glossary
A table explaining non-standard abbreviations and terms. For generally accepted abbreviations see the website at the Journal of Biological Chemistry (http://www.jbc.org/site/misc/abbrev.xhtml)

Biographical Sketch
Short academic history and list of papers published by the candidate. Date of birth and dates of earlier degrees are no longer included.

4. Organization of the Thesis

Introductory chapter

The introduction outlines the background of the field, and should set the stage for formulating the scientific question/problem addressed in the experimental part of the thesis. The introduction should tell a story with the candidate's own thoughts, to frame the question to be addressed in the thesis, and should not summarize all the papers that the candidate has read.

The last paragraphs of the introduction should explicitly state the questions to be addressed in the thesis, or the set of experimental aims, and the organization of the thesis.

Results chapters

Results chapters are most conveniently organized as papers or manuscripts, complete with abstract (250 word limit), introduction, materials and methods, results, figures and tables, discussion, and references. If there are several chapters with similar materials and methods the candidate is encouraged to organize all of the materials and methods into a single chapter. This eliminates unnecessary redundancy.

It is not necessary to include all of a published paper in a chapter, if for instance the candidate's contribution was a limited part. Additional data not included in the paper can also be added to a chapter.

One or more final chapters may include a collection of experiments that are not yet organized as manuscripts. These chapters should also have a title, an abstract, and a discussion that contains more in-depth interpretations and/or a general perspective on the overall set of results.

The paper format is encouraged as it is expected that every candidate will have one or more first author papers by the time of the thesis defense. However, the alternate format of having the thesis organized as separate chapters containing the Materials and Methods, Results, and Discussion is also acceptable.

Perspectives chapter

Each thesis should also include a final chapter (which could be entitled "Final Perspectives", "Perspectives", "Overall Conclusions", or some similar title) in which the candidate tries to tie up his thesis and add any overall perspectives. For example, the candidate might recapitulate the state of the field at the outset of the thesis, summarize the major results of the thesis, explain the status of the field as a result of the thesis work, explain current gaps in our knowledge of the field, raise questions that arise as a result of the thesis, or speculate on likely future directions of the field.

5. Description of the specific contents of each section of a chapter:

Title and Abstract: Each chapter should have its own title page, and an abstract page (abstract limited to 250 words)

Introduction: The introduction of each results chapter (manuscript, paper or results chapter) should outline the relevant background of the field without getting too expansive or detailed, and should frame the question(s) being addressed in the chapter in the context of the background. Often the last part of the introduction includes a very brief statement of the results and their significance.

Results sections:
Each experiment/group of experiments in the result section should include:

a statement of the purpose of the experiment
a description of the experiments and the results, with figures, tables, etc
a brief explanation or interpretation of the results.

Discussion sections:

The discussion section of results chapters should include a BRIEF summary of the major findings and discoveries, without regurgitation of the results section. This section of the chapter might also address questions such as: What does it mean? Why is it relevant? How does it add to/extend existing knowledge? What general conclusions and principles (beyond the immediate field of study) may arise from this research? What were the experimental problems, ambiguities, alternative explanations? What next?

Materials and Methods

This is the most important, and most read part of the thesis for your colleagues and lab mates (and your future self). Use the opportunity to carefully document techniques that you have worked out during your PhD research in a way that others can use it as a protocol book. If the results chapters come from published papers, the materials and methods may be removed from those chapters and grouped into a single chapter. This is generally recommended as it makes the thesis easier to read and a better source for techniques.

Figures and Legends

Each figure should be clear and self-explanatory. It should be possible to gain at least a superficial understanding of the displayed experiments without reading the text or figure legends.

Each legend should have a title that conveys the conclusion of the presented experiments or data. If there are multiple panels (A, B, etc), each of these should also have a title. The body of each legend should explain all items included in the figure.

Figures can be placed on separate pages, or can be embedded in the text as text boxes.

References

All references in the thesis should be modeled on a journal (such as Cell) and should include a full set of authors (for ten or less authors), the complete title of the work, and the volume, and page numbers (and editor and publishers as necessary). If using reference management software, the references should be checked manually for completeness and accuracy.

Supplements, appendices

This part of the thesis is not a requirement, but can be highly useful for including data that does not easily fit within the main part of the thesis. Examples include movies, genomic data sets, PCR primer sets, and crystallographic coordinates or even supporting preliminary data.