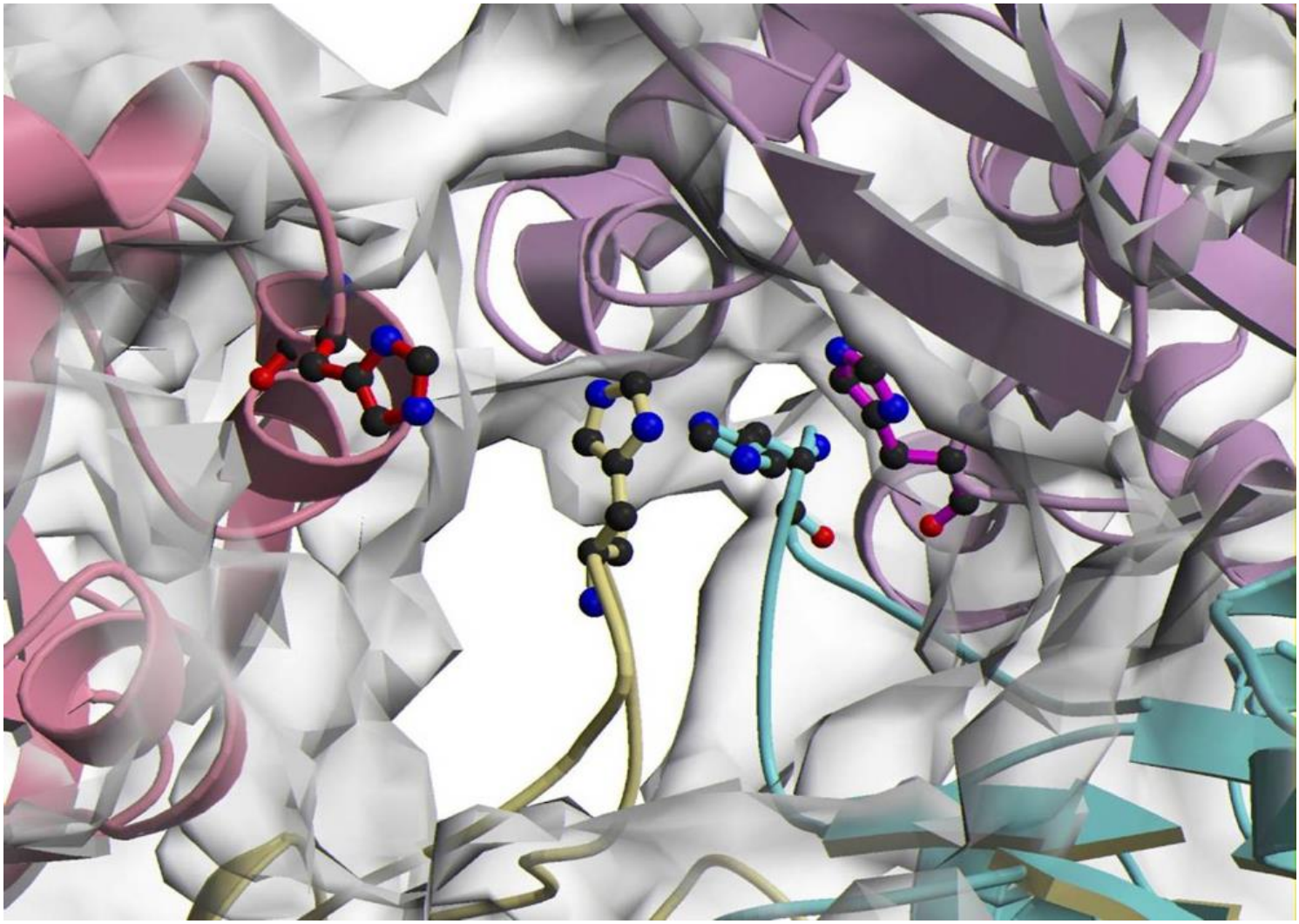
Molecular Biophysics & Structural Biology Graduate Program



Student Handbook
2017-2018 Academic Year

Welcome and Preface

Welcome to the Molecular Biophysics & Structural Biology Graduate Program. Molecular biophysics is an exciting interdisciplinary research field at the intersection of physics, chemistry, biology and medicine. The program integrates faculty across many schools and departments at the University of Pittsburgh as well as Carnegie Mellon University. The program is now in its seventh year (the first class started in the fall of 2004) and is still evolving. This handbook outlines the organization of the program and details information about our policies and guidelines.

The Molecular Biophysics and Structural Biology Graduate Program is committed to providing a progressive educational experience. Our exceptional resources and research environment offers outstanding training opportunities. An overall objective of our program is to train students in the dynamically evolving molecular biophysics field so our graduates will have a broad range of career options. Our program is actively evolving so be sure to check our website frequently for updated graduate program information!

We welcome you to the program and look forward in working with you to reach your educational goals.

James Conway, PhD, Co-Program Director
Gordon Rule, PhD, Co-Program Director
Molecular Biophysics & Structural Biology Graduate Program

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1. Roster of Program Faculty and Staff

Program Directors:

Dr. James Conway, Co-Program Director (412-648-9847; jxc100@pitt.edu)

Dr. Gordon Rule, Co-Program Director (412-268-1839; rule@andrew.cmu.edu)

Program Coordinators:

Ms. Cathy Barr, Graduate Program Administrator, University of Pittsburgh, Dietrich School of Arts & Sciences (412-624-4268; cbarr@pitt.edu)

Ms. Ena Miceli, Biological Sciences Programs Office, Carnegie Mellon University (412-268- 3012; emiceli@andrew.cmu.edu)

Ms. Lauren Zielinski, Student Affairs Specialist, University of Pittsburgh, School of Medicine (412-383-7866; lez26@pitt.edu)

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Department of Chemistry

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Alexander Deiters
Seth Horne
Kabirul Islam
Kazunori Koide
Sunil Saxena
Peter Wipf

University of Pittsburgh School of Medicine

Department of Anesthesiology

Yan Xu

Department of Cell Biology and Physiology

Sanford Leuba

Department of Computational Biology

Ivet Bahar
Panagiotis Takis Benos

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University of Pittsburgh, Graduate School of Public Health

Department of Environmental and Occupational Health

Patricia Opresko

Carnegie Mellon University, Mellon College of Science

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Chien Ho
Frederick Lanni
Gordon Rule
Alan Waggoner

Department of Chemical Engineering

Kris Dahl

Department of Chemistry

Catalina Achim
Mike Hendrich
Maria Kurnikova
Danith Ly
Eckard Munck

Department of Physics

Markus Deserno
Mathias Lösche
Robert Swendsen

2. Important Web Sites

***Please note: As a Molecular Biophysics & Structural Biology graduate student, you are responsible for all policies and procedures contained in the websites below. We encourage you to familiarize yourself with these websites and contact us if you have any questions.**

Molecular Biophysics & Structural Biology Graduate Program
http://www.mbsb.pitt.edu

University of Pittsburgh Graduate Studies
www.pitt.edu/~graduate/reg.html

Carnegie Mellon University, Mellon College of Science Policies
http://www.cmu.edu/mcs/about-mcs/policies.html

3. Program Structure

The main work of running the graduate program falls to committees under the direction of the Program Director. The Program Director takes a leadership role in ensuring the

quality of the Graduate Program; serves as a liaison with the chairs of relevant departments and with the deans of the participating schools; facilitates communication among members of the Steering Committee and its subcommittees; implements standard Graduate Program policies; and oversees the routine operation of the Graduate Program. The Program Director also serves as the primary interface between the committees and the students.

Committees

1. Steering Committee:
On a high level, the MBSB Steering Committee will ensure the interdisciplinary goals and focuses of the program are maintained. The committee will also make certain that the quality of graduate student training remains consistently high throughout the program. The Steering Committee will make individual decisions regarding requests for major shifts in a student's direction, including 1) requests to change dissertation advisors or membership of dissertation committees, and 2) recommendations by advisors or dissertation committees for student termination. The committee will vote to accept new members into the MBSB Training faculty, review program issues and develop proposals for policy revision when needed or suggested by other MBSB program committees.

Current members:

- James Conway (Co-Chair)
- Gordon Rule (Co-Chair)
- Rieko Ishima
- Saleem Khan
- Sanford Leuba
- Ron Wetzel

2. Curriculum Committee: This committee is responsible for monitoring the level, breadth and effectiveness of the curriculum, to propose changes where necessary; to co-ordinate with departments with participating faculty in order to maintain the courses and/or effect changes in them; and to interact closely with the faculty in the development of new courses. Requests for changes in the curriculum, either of course content or the deletion or addition of courses, are brought to this committee.

Current Members:

- Ben Van Houten (Chair)
- Lillian Chong
- Angela Gronenborn
- Sanford Leuba
- Gordon Rule

3. Admissions Committee: The Admission Committee is responsible for the graduate student admissions in the program. Applicants will be reviewed by committee, interview qualified candidates and recommend admission to the Program Director. In addition, the admissions committee tracks the success of the admissions process each year by maintaining pertinent information on the applicants. Recommendations for change in the standards for admission are made to the steering committee.

Current members:

- Andrew Hinck (Co-Chair)
- Mathias Losche (Co-Chair)
- Jinwoo Ahn
- Alexander Deiters
- Rieko Ishima

4. Recruiting Committee: The Recruiting committee oversees the development and maintenance of the MBSB graduate program web site; identify and directly contact potential students and develop and distribute promotional materials such as brochures and posters. Additional responsibility of this committee is to plan and oversee general recruiting efforts which may include scheduling of outside seminars, mailings, phone calls, etc as means of advertising the graduate program. The committee also works with the admissions committee to recruit outstanding applicants during the interview weekends. Finally, the committee may plan information for booths at conferences and manning of such to field questions.

Current Members:

- Rieko Ishima (Chair)
- Guillermo Calero
- Kris Dahl
- Guillermo Romero

5. Funding Committee: The Funding committee identifies grants and support for graduate students, such as NIH training grants, and makes recommendations specific to funding venues and program guidelines to the Program Director. The funding committee may work with graduate program administrator(s) to maintain a database of information on fellowships available to graduate students in the program and encourage and support each student in writing fellowship applications. This committee may actively review the graduate program and make recommendations to the Steering Committee for specific programmatic changes that will move the program to be competitive for training grants. As such, this committee works with the Curriculum, Recruitment, and Oversight & Evaluations committees to ensure that various areas (e.g national recruitment, course offerings, monitoring of progress, etc) of the graduate program is competitive for training grants or other funding. Specific recommendations targeting funding venues may also be addressed by this committee.

Current Members:

- Ron Wetzel (Chair)

- James Conway
- Chien Ho
- Alan Waggoner

6. Oversight and Evaluations Committee: The Oversight and Evaluation committee is responsible for monitoring the progress of each graduate student. It prompts interim advisors to review the progress of first year students, which includes a brief written assessment after the first term. This committee conducts the first–year student evaluation and facilitates the comprehensive exam process according to the schedule described below. The committee also evaluates student progress annually thereafter to ensure necessary coursework has been satisfied, bi-annual dissertation committee meetings have been held, etc. Any problems detected are brought to the attention of the student, dissertation advisor and Program Director.

Current members:
- Patricia Opresko (Chair)
- James Conway
- William Furey
- Seth Horne
- Maria Kurnikova
- Gordon Rule

4. Program Academic Plan of Study and Requirements

Year I:

Entering Students: Entering students in the Molecular Biophysics & Structural Biology Graduate Program are primarily students in the target pool who have a strong interest in structural and physical areas of biology including X–ray crystallography, NMR, molecular dynamics and related computational areas, thermodynamics, kinetics, etc.

Academic Advisors*:* Upon matriculation, each student will be assigned a first year mentor based on research interest. The first year advisor's role is to advise the student about courses and laboratory rotations until a dissertation advisor is selected. The advisor is responsible for proposing modifications to the standard plan based on specific needs of the student and for representing the student for faculty evaluation. Students are required to meet with their advisors early upon entry into the program and at roughly ten-week intervals thereafter. One focus of these meetings is the selection of the next research rotation; in addition, a general discussion of the student's progress within the program is expected. Students are encouraged to consult with their advisor, as needed. Once the student has selected a dissertation laboratory, the dissertation advisor and committee will assume the advisory role. Students are required to meet formally with their dissertation committees at least twice a year.

Molecular Biophysics I: Structure

Molecular Biophysics II: Biomolecular Interactions & Dynamics

Molecular Biophysics III: Theory & Simulation

The three courses listed above constitute the common core coursework for the first and second year; collectively they cover the theories, techniques and seminal observations that form the foundation of molecular biophysics. The primary format will be a team taught lecture series, however, that will be augmented with laboratory and hands-on demonstrations, review and discussion of actual grant applications and their reviews, and examples from the current literature presented by the students themselves in a Journal Club format. The division into the three areas of structure, interactions and dynamics is obvious in the case of some of the subtopics considered, less so for others, in part because of the many overlaps and interconnections within the field. The complete series represents a comprehensive introduction to molecular biophysics at the graduate level. The course series will combine several similar courses currently offered in the School of Medicine, Dietrich School of Arts & Sciences at the University of Pittsburgh and Carnegie Mellon University.

Topics covered include: DNA, RNA and protein structure (as determined by both X-ray and NMR techniques), the structural dynamics of proteins and nucleic acids, protein folding, protein-ligand binding (including cooperativity and allostery), protein-protein and protein-nucleic acid interactions, virus structure and assembly, membrane biophysics including the properties and behavior of ion channels and receptor biophysics. These problems are studied together with fundamental physical principles including statistical mechanical, thermodynamics and kinetics. Emphasis will also be placed on the experimental and computational methods underpinning the preceding. Topics here will include: X-ray crystallography, NMR, numerically intense computational methods including molecular dynamics and free energy calculations, bioinformatics methods, spectroscopy, enzyme kinetics, experimental thermodynamic and calorimetric methods. An important goal of the courses is to integrate the individual topics into a coherent picture of this emerging discipline.

Programming Proficiency: Programming proficiency is a general requirement for the MBSB program, because of the abundance of computing skills throughout all areas of biophysics. Thus, being able to program is beneficial not only for research but also in courses, in particular the MB3 course. To help those students lacking programming experience, remedial courses are to be taken in the spring semester. Students can choose from several undergraduate-level programming courses offered in the spring unless they demonstrate sufficient programming proficiency. Students need to take the course for credit, but these credits do not count towards the PhD degree since this course is considered remedial. To evaluate programming proficiency, we designed a short test to be taken during the Fall semester of the first year. Students successfully passing this test, are not required to take a programming course.

Scientific Ethics and the Responsible Conduct of Research (1 credit): The course is an introduction to the basic ethical issues which arise in the course of conducting scientific research. It is intended for graduate students and fellows in the biomedical sciences who have completed at least one year of graduate work. The course will be composed of informal lecture presentations followed by discussion issues in small groups.

Introduction to Statistical Methods 1 (3 credits): This course discusses techniques for the application of statistical theory to actual data. Topics include probability

theory, estimation of parameters, and test of hypothesis for both the discrete and continuous case.

Elective Courses (Total of 6 credits): The courses taken here will be chosen on an individual basis based on the background and interests of the individual student. During the first year, the choice will be made by the student in consultation with the First Year Advisor or Dissertation Advisor. Upon proper approval, elective courses can be taken at either the University of Pittsburgh (both the Dietrich School of Arts & Sciences and the School of Medicine) as well as Carnegie Mellon University.

Molecular Biophysics & Structural Biology (MBSB) Seminar: Students are expected to attend this seminar every fall and spring semester throughout their tenure within the program.

Data & Literature Club: With the exception of the first fall term, students are expected to attend this seminar every fall and spring semester throughout their tenure within the program.

Research Rotations (3 credits, Fall; 1 credit, Spring; 1 credit and Summer; 1 credit): Laboratory research is a major component of the MBSB graduate program. Research rotations should be considered an invaluable resource for learning broad-based skills at the bench as well as an opportunity to focus your scientific interests.

The First Year Mentor and Program Director supervise the selection of laboratory research rotations. Each student is expected to complete three (3) research rotations during the first year. It is required that three rotations of eight week durations be performed in three different laboratories headed by training faculty of the Molecular Biophysics & Structural Biology Graduate Program. The first rotation starts approximately eight weeks after the start of the first semester, to allow the students some time to acclimate to the structure of the program and classes. Rotations provide students with an opportunity to identify an area of research interest, to establish a relationship with a potential dissertation advisor, and to learn various laboratory techniques. Students are therefore expected to place a major emphasis on their laboratory research in order to allow for mutual evaluation by the student and mentor.

At the end of each rotation, a written report that is prepared in the style of a scientific paper [Guidelines on how to write a laboratory rotation report are provided in orientation]. It is recognized that some rotation projects emphasize concepts and techniques rather than generating large volumes of data. Thus considerable flexibility in the style and content of the report is possible. The main goal is to generate a written, scholarly account of the scientific principles, questions, and activities undertaken during the rotation period. It is therefore expected as part of this exercise that rotation advisors will read, comment upon, and discuss changes to the rotation report with the student. When the written report is complete, the rotation supervisor will review the performance of the student and assign a letter grade for the rotation on the evaluation form provided by the administrators of the Molecular Biophysics & Structural Biology Graduate Program.

Upon completion of the third rotation, students should rank their PhD thesis lab preferences. The placement of a student in a laboratory will be negotiated by the student

directly with the potential dissertation advisor with the help of the program director and/or first year mentor if needed. Generally, students will enter the laboratory of first choice. However, in rare occasions the capacity of the laboratory may limit the student to their second or third choice. Students should keep in mind that their performance in a rotation is the principal basis for acceptance into a research lab for their PhD work. Consequently, all rotations should be taken seriously as students may not be accepted into their first choice lab.

Approximate dates of rotation presentations, reports, and evaluations (actual schedule of rotations will be provided at orientation):

Rotation 1 (Late-October to Early January) A copy of rotation report will be due in the **Graduate Office & to Lab Supervisor** on the last day of the rotation.

Rotation 2 (Early January to Early March) A copy of rotation report will be due in the **Graduate Office & to Lab Supervisor** on the last day of the rotation.

Rotation 3 (Early March to Late April) A copy of rotation report will be due in the **Graduate Office & to Lab Supervisor** on the last day of the rotation.

***Approval must be requested by the student and granted in writing by Program Director to complete a 4th rotation.**

PhD Dissertation Mentor to be declared in early May. Students will begin working in his/her dissertation laboratory on by Mid-May of the first year.

NOTE: Reports submitted after each due date will lose 1/3rd of a grade for each day the report is late. Research Rotation Evaluation forms are due from the rotation advisor, in the Graduate Office, within two weeks after the report due date.

First Year Evaluation (Preliminary Evaluation): The Oversight & Evaluations Committee will meet at the end of the Spring Term to evaluate the progress of the first year students. This evaluation will include a review of performance in courses as well as written evaluations by the faculty members involved in the laboratory rotations. One of three decisions will be made for each student: 1) The student may be advanced to the second year in good standing. 2) The student may be conditionally advanced; he/she would then be directed to specific course requirements that would address the committee's concerns. 3) The student may be dismissed from the program.

Summary of Course Requirements in the First Year:

Fall
Laboratory Research Rotation
Foundations of Biomedical Science
Molecular Biophysics I: Structural Biophysics
MBSB Seminar

Spring
Molecular Biophysics II: Biomolecular Interactions and Dynamics
Laboratory Research Rotation
Introduction to Scientific Programming (Actual Course title and number of credits TBD) MBSB Seminar
Data and Literature Club

Summer
Laboratory Research Rotation
Introduction to Statistical Methods 1 (BIOST 2041)
Scientific Ethics and the Responsible Conduct of Research (INTBP 2290)

Year II:

Overview: Students are expected to select a research advisor before the end of the third rotation (unless special permission is granted for a 4th rotation by the Program Director). Students will also continue program coursework and complete the Comprehensive Examination.

Summary of Course Requirements in the Second Year:

Fall
Molecular Biophysics III: Theory & Simulation
MBSB Seminar
Data and Literature Club
Advanced Elective(s) - 6 credits are required before graduation

Spring
MBSB Seminar
Data and Literature Club
Advanced Elective(s) - 6 credits are required before graduation

5. Comprehensive Examination

The Comprehensive Examination is the major requirement that a student must pass before being admitted to candidacy for the doctoral degree. This exam provides the student with an opportunity to master a literature that is relevant to their research interests and ultimately to demonstrate that the needed competency has been achieved. The format of the exam is also designed to provide training in the preparation and defense of grant proposals.

The specific educational goals of the Comprehensive Exam are to test the student's ability to:

- independently evaluate and critique a body of literature,
- integrate the acquired information into broad conceptual schemes,
- develop testable hypotheses,

- devise experimental approaches and thereby evaluate hypotheses,
- demonstrate the communication skills required to present and defend scientific ideas in oral and written formats.

The topic of the Comprehensive examination may overlap with the student's research interests and general dissertation goals. However, it is expected that the proposed plan be original in its conception and scholarly in its execution. This means that the research proposal submitted for the comprehensive examination must be demonstrably different from work that has been previously designed and discussed or written up in any form by either the student or the research mentor.

Students are required to complete the Comprehensive Exam by August 31 of their second year in the graduate program. Any requests for a delay in this schedule must be made in writing to the Director of the Graduate Program; such requests should include a reason for the delay, as well as the time when the student proposes to take the exam. Note that although the exam process must be started by May of the second year (in order for the entire process, including a 2nd examination, if needed, to be completed by the end of August), the student may initiate the process at any time after completing his/her core curriculum. It is recommended that students begin the process in the spring semester of their 2nd year.

Committee: By **May 1** of their second year, students are required to submit to the Evaluations Committee a brief description of three research topics (approximately one page each with a brief summary and listing of Specific Aims) from which they would like their exam topic to be chosen. The proposed topics should reflect an informed analysis of the relevant literature and should be supported by essential citations. The committee will then pick the research topic on which the student will be examined, with the committee selecting from one of the three topics the student has provided, or a modification of one of these areas. The committee will ensure that the topic that is agreed upon does not overlap excessively with the student's dissertation project. In this regard the goal for the student is to develop expertise in literature and technical approaches that go beyond those anticipated to be components of their dissertation research.

The Evaluation committee will then select a Comprehensive Exam committee, including a chairperson. This committee will contain three members of the MBSB graduate training faculty. The research advisor cannot serve on the committee. The student is encouraged to interact with the committee to ensure that the specific aims page is appropriately written such that the student is likely to be successful in developing the proposal.

Written Exam: After receiving the specific research topic, students have 5 weeks to write a "grant application" based on this problem. Thus, students will need to evaluate the literature in the selected area, formulate significant and relevant hypotheses, and devise experimental strategies to test their hypotheses. The written report should follow the basic form of an NIH R01 application, and should be a realistic proposal for 3 years of research from a new investigator. It should include all of the following sections of an NIH research grant proposal. **Specific Aims:** This section should include a statement of

the hypotheses to be tested and the goal or objectives of the proposal (**1 page**). **Research Strategy:** This section (**maximum of 12 pages**) should contain i) Significance (2-3 pages), ii) Innovation (1-2 page), and iii) Approach (7-9 pages) sections. The Approach section should describe methods and experiments that are proposed to achieve the research goals of the proposal. This section should place less emphasis on methodological details and more emphasis on anticipated outcomes and potential experimental pitfalls. This section should accommodate unexpected findings and alternative strategies should be identified. **Preliminary Studies**, which are also part of the Approach section, should include a brief description of the types of preliminary data the student feels are necessary to support the proposal. **Literature Cited:** Full citations of all referenced literature should be included (there is no page limit for this section). For details of the R01 application format, margins and font requirements, see instructions for preparing an NIH grant application on the NIH web site. Students are encouraged to look at actual NIH grant applications submitted by their advisor or other committee members to get a sense of what is included in an application.

The Chair of the O&E committee (or a representative) along with the Director(s) of the MBSB Graduate Program will meet with all the students taking the comprehensive examination to discuss the ground rules for the exam and will answer any questions about the exam that the students may have. While working on the written portion of the Exam, it is appropriate for students to discuss their ideas with their committee members as well as with other faculty and students. However, such interactions should be restricted to seeking information on the strengths and weaknesses of experimental approaches and not include a discussion of the feasibility of the experiments that the student anticipates proposing. Students may seek feedback from their committee on their Specific Aims within the first two weeks of the 5-week period. However, students are not allowed to receive assistance with written drafts of their Exam or guidance in the construction of the proposal from their faculty advisors, other faculty, or senior postdoctoral fellows. However, students should ask fellow lab members and graduate students to read and critique their documents. A critical aspect of the Committee's evaluation will be on the scientific writing of the proposal.

9.3.4. Oral Exam: Within one week after submission of the written proposal, the student's committee will decide whether the student has passed or failed the written portion of the examination. A failure in the written part will constitute one failure in the full comprehensive examination. If the student's written proposal is considered acceptable, there will be an oral examination as soon as possible (generally within 1-3 weeks after passing the written examination). The oral exam consists of a brief (~15 min) presentation of the proposal to the student's Evaluation Committee followed by an oral exam (~ 2 hr total). At the oral examination students will be expected to defend their hypotheses and to address questions concerning all background information relevant to the topic, significance, and design of the experiments they have proposed. Students should expect that their examination may encompass the breadth of molecular biophysics and structural biology as related to the proposal. Students should be able to explain the basis of all techniques proposed as well as the appropriate controls. Students are strongly encouraged to schedule a "mock oral exam" with other graduate students prior to the exam with the Committee.

9.3.5. Evaluation: At the end of the oral exam, the student will be excused from the room and the committee will evaluate the student's performance. The student will then be immediately informed of the decision of the committee. The possible outcomes are pass or fail. If the student fails the oral examination, he/she will be allowed to retake the oral exam provided that they are not already on probation. The student may also be asked to revise his/her written proposal based on the comments/criticisms of the committee.

The second exam must occur within 2 months of the initial exam. The second exam committee will consist of at least one original committee member and up to two new members, selected by the Oversight & Evaluations Committee. The exam must be passed before a student can apply for admission to candidacy for the Ph.D. Once this examination has been passed, the program notifies the appropriate Dean of Graduate Studies of that fact.

Year III through Graduation

Teaching Requirement: Students are required once during their graduate student career to serve as a Teaching Assistant. Most often, this will occur in the third year of study. Students will be asked to assist with MB1 and MB3 course duties. Therefore, to be eligible to complete the teaching requirement, students must have successfully completed the MB course series. MSTP students are exempt from this requirement, as MSTP students are not permitted to be a TA during their graduate training.

Advanced Elective Courses: Students are required to complete at least six credits of advanced courses. The goals include providing both breadth and a rigorous background in their chosen area of specialization; they will therefore be chosen in consultation with their advisor with potential input from their dissertation committee. Possible topics include: Graduate physical chemistry, statistical mechanics, simulation and related computational methods, advanced methods in X-ray crystallography, NMR spectroscopy, other spectroscopic methods, calorimetry, structural informatics, numerical methods and advanced topics in molecular biophysics.

Dissertation Committee: Within three months of passing the Comprehensive Exam, the student must form a dissertation advisory committee and seek approval from the Program Director and appropriate Dean. The dissertation committee should meet initially within 6 months of passing the Comprehensive Exam and bi-annually thereafter. To accommodate both University and Program requirements, the committee make-up should be as follows: The committee should consist of four or more members including his/her dissertation advisor. If the student is affiliated with Pitt's School of Medicine, the majority of the committee (including the major advisor) must have Graduate Faculty Status. If the student is affiliated with Pitt's Dietrich School of Arts & Sciences, all committee members must have Graduate Faculty Status. Whether the student's home University is Pitt or CMU, the majority of the committee must be a member of the MBSB Graduate Program Training Faculty. One member of the committee must be from outside of the MBSB Graduate Program Training Faculty at either Pitt or CMU. Special requests to have a member outside of the Pitt or CMU faculty may be granted upon request. The chair and major advisor may be the same person. If the chair is not the same as the major advisor AND the student's home school is CMU, the Chair must be a regular faculty

member with the rank of Assistant Professor or higher. One of the responsibilities of the student advising committee is to assess when the student has made satisfactory progress in their research such that they can begin to write their thesis and set a tentative date for the defense.

Dissertation Research: This follows "standard" practice: A student joins a lab, chooses a problem, accumulates some preliminary data while becoming familiar with it and prepares a written proposal that is submitted to the dissertation committee. The committee meets bi-annually to discuss the student's progress and a PhD is awarded after successful defense of the dissertation. *(Please see The Prospectus/Overview Meeting, Admission to PhD Candidacy, Dissertation Defense, and Dissertation Approval descriptions and requirements for more detail.)

Overview/Prospectus Milestone: The student's dissertation advisory committee, pending approval of the Program Director and appropriate Dean, meets and approves the dissertation proposal at the first meeting of the Dissertation committee.

In the Fall Term of the third year the student is expected to prepare a dissertation prospectus for evaluation by his/her dissertation committee. Following approval by the committee research shall continue with annual dissertation committee meetings until the project is complete and defended. As indicated elsewhere, the program has set a five-year target time to degree which students are expected to achieve. Attendance at the Molecular Biophysics Seminar and participation in the Literature and Data Club is required throughout graduate training. It is anticipated that most students will take additional, elective courses (with the concurrence of their advisor and dissertation committee) to broaden their knowledge of this interdisciplinary field. Although the specific courses will be chosen based on the individual student's needs, it is recommended that each student complete at least nine credits of elective coursework. One of the functions of the Molecular Biophysics & Structural Biology Program Committee will be to facilitate the selection of elective courses by maintaining an up to date compendium of relevant courses offered throughout the University.

Annual Evaluation of students in Year II through Graduation

The Oversight & Evaluations Committee will meet at the end of the Spring Term to evaluate the progress of all the students in the program. This evaluation will include a review of student performance in courses, written self-appraisal by the student, and a written evaluation by the student's thesis advisor. The committee will evaluate the students' research progress, research effort, publications, scientific presentations, and other scholarly activities. Each student will be provided a written report of their evaluation by the committee. One of two decisions will be made for each student: 1) The student's performance may be considered satisfactory and in good standing. 2) the student's performance may be considered unsatisfactory; in such a case, the student will be informed about the area(s) of his/her weakness(es) and a specific timeline to correct such weaknesses. The student may also be put on academic probation for a specified time period to correct the above weaknesses. At the end of the probation period, the committee will re-

evaluate the student's performance. If the student has successfully corrected the weaknesses, the student will be considered in good standing. However, if the student has failed to correct the weaknesses, he/she may be dismissed from the program.

Summary of Requirements for the Ph. D. Degree

Year I:

- Successful completion of three laboratory rotations
- A favorable First Year Evaluation.
- Selection of a Research Advisor

Year II:

- Successful completion of required courses
- Successful completion of the Comprehensive Examination.
- Satisfactory progress in dissertation research. (40 credits needed to graduate)
- Active participation in MBSB Seminar and Data & Literature Club.
- Advanced courses (completion of at least 6 credits before graduation)
- A favorable Second Year Evaluation

Year III through Graduation:

- Active participation in MBSB Seminar and Data & Literature Club.
- Successful completion of advanced elective courses
- Selection of a Dissertation Committee
- Approval of thesis topic
- Overview Prospectus Meeting
- Admission to Candidacy
- Satisfactory progress in dissertation
- Favorable Evaluations by the O & E Committee
- The writing and successful defense of a Ph. D. Dissertation

Registration Requirement

The University of Pittsburgh has Fall, Spring, and Summer terms. To maintain your status in this program, you must register for 9-15 credits in the Fall and Spring terms and 3 credits in the Summer term.
Students appointed to Carnegie Mellon University will need to be a full time student according to CMU guidelines.

6. Medical Scientist Training Program (MSTP)

A MSTP student (medical scientist training program – see http://www.mdphd.pitt.edu/) who wishes to conduct graduate studies in the MBSB program should identify potential research laboratories and meet with respective PIs. The student should also forward all

transcripts (undergraduate and graduate), standardized test results (MCAT, GREs), and letters of recommendation to the Program Director, who will send the request to the appropriate committee(s) for evaluation.

Program requirements specific for MSTP students (MD/PhD) factor in the MSTP students' advanced training outside of our program. These students are typically considered advanced students and rotation and course requirements for the program are modified as follows.
(7a) The three molecular biophysics core classes (MB I-III) are required. The core classes essentially define our program and the minimum base of knowledge necessary for a PhD degree. There is little overlap between the MB core courses and other MSTP program content.
(7b) The requirement for the Foundations course can be waived as their medical curriculum covers similar subject content.
(7c) A single "conditional" lab rotation is possible, rather than the three typically required, although more may be needed if a suitable lab is not identified. Given the time constraints of their schedules, this will allow MSTP students to start research sooner, provided the first rotation leads to a mutually agreeable situation.
(7d) MSTP students are exempt from the normal teaching requirement, since MSTP students are not permitted to be a TA during their graduate training.
(7e) MBSB MSTP students are expected to take the *Introduction to Statistical Methods 1* summer course, but are exempt from the *Scientific Ethics* summer course offered by MBSB. Instead they will attend the ethics course offered by the MSTP program (MSTP 5983).

It is intended that these modifications to the standard program will permit fulfillment of the MBSB PhD requirements within four years, although longer studies may be needed for completion of the thesis research.

7. Terminal Master's Degree

Students are not admitted to the Molecular Biophysics & Structural Biology Program to pursue an M.S. degree, but it might become necessary for a Ph.D. student to transfer to an M.S. track for a variety of reasons. They could include factors beyond the student's control, *e.g.*, medical circumstances or a change in family circumstances necessitating a long-distance move. They could also include academic factors such as an unsatisfactory performance in the Ph.D. Comprehensive Examination. In any of these, or similar circumstances, a student may petition to be transferred to a terminal Master's program. The petition must be addressed in writing to the program director and must have the support of the laboratory advisor.

The requirement for passing an M.S. comprehensive examination is met by an oral exam based on a brief (approximately two page) proposal for the Master's dissertation research. The student's Dissertation Committee will administer this examination. The scope of the Master's research proposal should be appropriate for a Master's dissertation and therefore less than for a Ph.D. dissertation. For students who transfer to the M.S. track after attempting the Ph.D. comprehensive examination, the examining committee has the

option of deciding that the Ph. D. examination meets the requirement for an M.S. comprehensive examination. Masters students must submit and defend a thesis and comply with all applicable University requirements for the Master of Science degree.

8. Leave of Absence

Under special conditions, graduate students may be granted one leave of absence. A maximum leave of two years may be granted to doctoral students or one year to master's students. The length and rationale for the leave of absence must be stated in advance, recommended to the Associate Dean by the Program Director, and approved by the Associate Dean. If approved, the time of the leave shall not count against the total time allowed for the degree being sought by the student. Readmission following an approved leave of absence is a formality.

9. Financial Award and Health Insurance

As a full-time graduate student in good standing in the Molecular Biophysics & Structural Biology Graduate Program, you will receive a funding package of individual health insurance, tuition remission, and a one-time $2,000 educational enrichment account. In order to retain your financial award, you must maintain a minimum cumulative grade point average of 3.00 and be considered a full-time student according to the registration requirements at the University you are associated with. Please be advised that a grade of B- or lower is not considered a passing grade when taking the core courses.

You will be provided individual health insurance. The option to purchase dental, vision, or medical insurance for a dependent is available for an additional cost.

You will be able to access your one-time $2,000 Educational Enrichment Account beginning the first day of your appointment (September 1, 2016). You will have two years to use the fund; therefore, the account will expire August 31, 2018. Purchases made prior to September 1, 2016 cannot be reimbursed by the educational enrichment account. Funds may only be used to support the purchase of items or services with will enrich your graduate education. These may include educational books, subscriptions to scientific journals, a computer, or expenses incurred to attend scientific meetings. A complete set of guidelines will be distributed at orientation.

Questions or concerns regarding your financial award and health insurance should be directed to the Program Director.