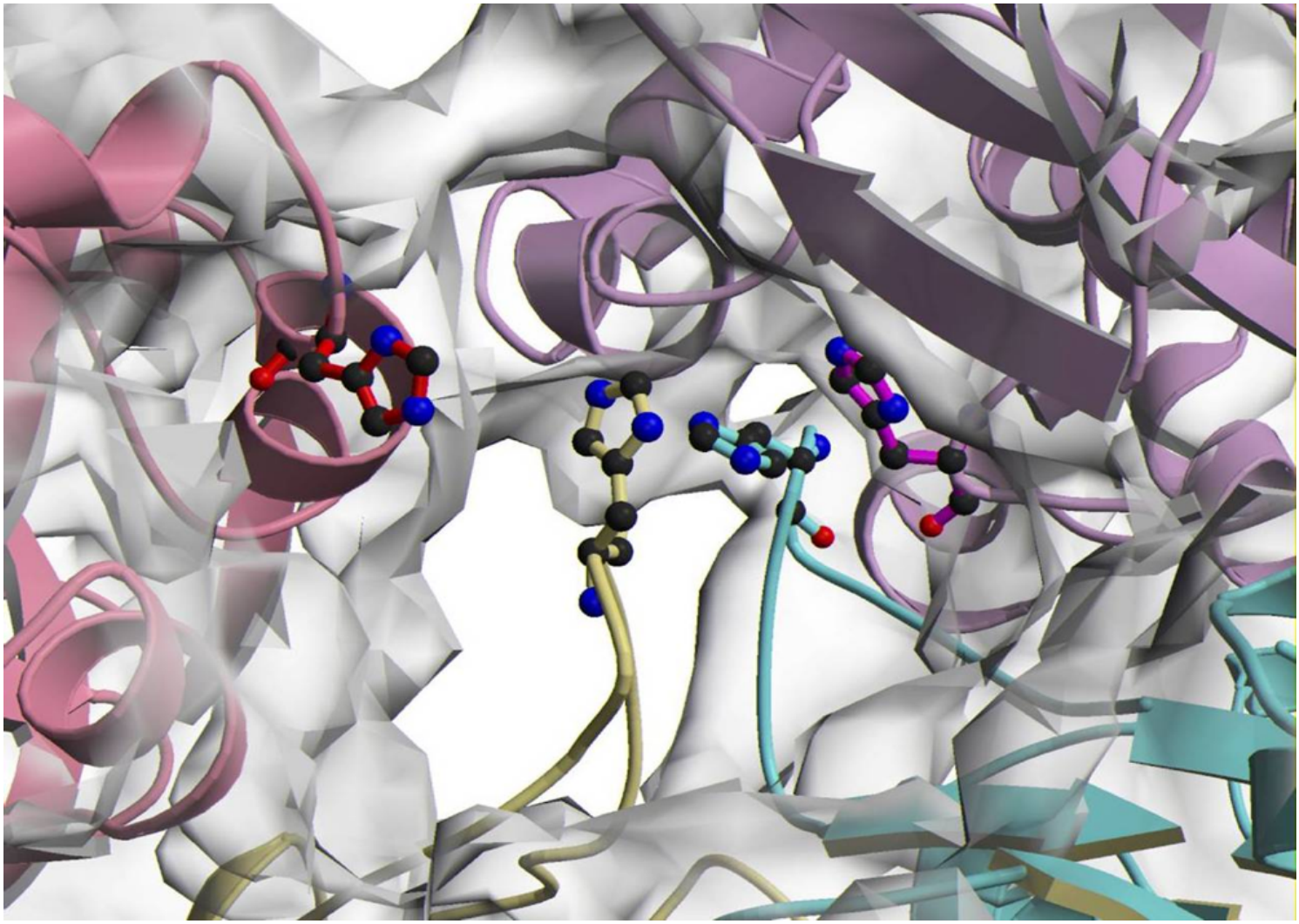
Molecular Biophysics & Structural Biology Graduate Program



Student Handbook
2022-2023 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 nineteenth 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. Please also be sure to attend periodic town hall meetings to learn about Program updates and to provide your input into Program governance!

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

Andrew Hinck, PhD, Co-Program Director
Maria Kurnikova, PhD, Co-Program Director
Molecular Biophysics & Structural Biology Graduate Program

Table of Contents

1. Roster of Program Faculty and Staff

Program Directors:

Dr. Andrew Hinck, Co-Program Director (412-648-8533; ahinck@pitt.edu)

Dr. Maria Kurnikova, Co-Program Director (412-268-9772; kurnikova@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. Sarah Biancardi, Department of Cell Biology, University of Pittsburgh, School of Medicine (sab181@pitt.edu)

Training Faculty:

University of Pittsburgh, Dietrich School of Arts & Sciences

Department of Biological Sciences

Jeffrey Brodsky
Anne Carlson
Jacob Durrant
Andrew VanDemark

Department of Chemistry

W. Seth Childers
Lillian Chong
Rob Coalson
Alexander Deiters
Seth Horne
Kabirul Islam
Kazunori Koide
Sunil Saxena
Peter Wipf

University of Pittsburgh School of Medicine

Department of Anesthesiology and Perioperative Medicine

Pei Tang
Yan Xu

Department of Cell Biology and Physiology

Sanford Leuba

Department of Immunology

Jason Lohmueller

Department of Microbiology and Molecular Genetics

Saleem Khan
Patrick Moore
Thomas Smithgall

Department of Pharmacology and Chemical Biology

William Furey
Bennett Van Houten
Jean-Pierre Vilardaga
Cheng Zhang

Department of Structural Biology

Ümit Akbey
Guillermo Calero
Jonathan Coleman
James Conway
Angela Gronenborn
Andrew Hinck
Rieko Ishima
Stella Sun

University of Pittsburgh, Graduate School of Public Health

Department of Environmental and Occupational Health

Patricia Opresko

University of Pittsburgh, Graduate School of Pharmacy

Department of Pharmaceutical Sciences

Simone Bixius-Anderko

Carnegie Mellon University, Mellon College of Science

Department of Biological Sciences:

Frederick Lanni
Gordon Rule
Huaiying Zhang
Yongxin (Leon) Zhao

Department of Chemistry

Olexandr Isayev
Maria Kurnikova
Danith Ly

Department of Physics

Markus Deserno
Stephanie Tristram-Nagle

Carnegie Mellon University, College of Engineering

Department of Electrical and Computer Engineering:

Maysam Chamanzar

2. Policies

As a Molecular Biophysics & Structural Biology graduate student, you are responsible for complying with all policies and procedures of the MBSB Program, as well as the respective School and University in which your faculty advisor resides. Information about these policies can be found in the websites below listed 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://mbsb.pitt.edu/

University of Pittsburgh Graduate Studies - https://www.provost.pitt.edu/students/graduate-studies

Carnegie Mellon University, Mellon College of Science Policies - https://www.cmu.edu/graduate/policies/

University of Pittsburgh, Office of Diversity and Inclusion - https://www.diversity.pitt.edu/

Carnegie Mellon University, Center for Student Diversity and Inclusion - https://www.cmu.edu/student-diversity/

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:

- Andy Hinck (Co-Chair)
- Maria Kurnikova (Co-Chair)
- James Conway
- Bill Furey
- Jonathan Coleman
- Ben Van Houten
- Angela Gronenborn

2. Curriculum Committee: This committee is responsible for monitoring the level, breadth and effectiveness of the curriculum, to propose changes where necessary; to coordinate 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
- Emma DiBernardo (Student Representative)

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:

- James Conway (Chair)
- Alexander Deiters
- Rieko Ishima
- Leon Zhao
- Thomas Smithgall

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:

- Jonathan Coleman (Chair)
- Rieko Ishima
- Guillermo Calero

5. 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:

- William Furey (Chair)

- Seth Horne
- Olexandr Isayev
- Patricia Opresko
- Gordon Rule

6. Seminar Committee: The seminar committee organizes the MBSB seminar series held during the fall and spring terms. The committee is responsible for soliciting suggestions for seminar speakers from the training faculty and students and selecting from these speakers that will present diverse topics in contemporary areas of structural biology and biophysics that are of benefit to both the training faculty and students.

- Andrew vanDemark (Chair)
- Angela Gronenborn
- Huaiying Zhang
- Kasia Thomas (Student Representative)

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 advisor 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: Molecular Interactions & Dynamics

Molecular Biophysics III: Molecular Modeling & Computational Chemistry

The three courses listed above constitute the common core coursework for the first 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. Students can choose from several undergraduate-level programming courses 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.

D2K: From Data to Knowledge-Biomedical Experimental Design and Analysis (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 successfully attend this class throughout their tenure within the program.

Data & Literature Club: Students are expected to successfully attend this class, total seven semesters throughout their tenure within the program; typically, attendance begins in the Spring semester of the first year.

In cases where an elective course overlaps Data & Literature Club or MBSB Seminar, students may petition the program directors to be absent from Data & Literature Club or MBSB Seminar for that semester. To be granted this exception the elective course must be closely related to the student's thesis work and there are no other opportunities for the student to be exposed to this material. This option will only be granted once to a student. The student will still register for Data & Literature Club or MBSB Seminar, but they will complete a different assignment that is defined by the instructor of the course. Typical assignments could include writing a review article in an area that is approved by the instructor of the course.

Research Rotations: 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 Advisor 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 their advisor.

At the end of each rotation, a written report that is prepared in the style of a scientific paper. 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 advisor 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 Mid-December) 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 Advisor 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
Molecular Biophysics I: Structural Biophysics
Laboratory Research Rotation I

Foundations of Biomedical Science
MBSB Seminar
Spring
Molecular Biophysics II: Molecular Interactions and Dynamics
Molecular Biophysics III: Molecular Modeling & Computational Chemistry
Laboratory Research Rotation II and III
MBSB Seminar
Data and Literature Club

Summer
Laboratory Research Rotation IV (optional)
D2K: From Data to Knowledge-Biomedical Experimental Design and Analysis (INTBP 2013)
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
MBSB Seminar
Data and Literature Club
Scientific Computing
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 the literature in their own area of research 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 research proposals, both orally and in written form. 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 is expected to 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 proposals in any form (i.e. written, orally presented, or informally discussed) that the student has received from his/her faculty advisor, other members of his/her research laboratory, or other sources. This also means that the faculty advisor may not be involved in any stage of the process, from project conceptualization to writing and critiquing the proposal.

Students are required to complete the Comprehensive Exam by May 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.

Committee: Students will be contacted by the third week of February of their second year and asked to submit to the Oversight and Evaluations Committee a brief description of two research topics (approximately one page each with a brief summary of the research problem 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 and should be submitted to the Oversight and Evaluations Committee no more than 4 weeks after the initial request. The committee will then pick the research topic on which the student will be examined, with the committee selecting from one of the two topics the student has provided, or a modification of one of these areas. The committee will ensure that the specific topics chosen for study do not substantively overlap with any proposals that his/her faculty advisor or other members of his/her research laboratory: 1) is currently preparing, 2) has already prepared and submitted for review, or 3) has been submitted and been funded (or submitted and currently undergoing revision) by contacting the student's faculty advisor at both the abstract and full written proposal stages. In this regard the goal for the student is to develop expertise in the relevant literature, technical approaches, and experimental design without relying on his/her faculty advisor or other members of his/her research laboratory.

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 and the membership of their examining committee, students have four weeks to write a research proposal in the style of an NIH F30 or F31 research training plan based on this topic. Thus, students will need to evaluate the

literature in the selected area, identify gaps in knowledge, formulate significant and relevant hypotheses, and devise experimental strategies to test their hypotheses. The written proposal should follow the basic form of an NIH F30 or F31 research training plan and should be a realistic proposal for 3 years of research for a student enrolled in a PhD granting graduate program. The proposal should only include the **Specific Aims and Research Strategy** sections of an NIH F30 or F31 proposal. The **Specific Aims** section (**maximum of 1 page)** should include a statement of the hypotheses to be tested and the goal or objectives of the proposal. The **Research Strategy** section (**maximum of 6 pages**) should include i) **Significance** (ca. 1-1/2 pages) and ii) **Approach** (ca. 4-1/2 pages). Unlike the NIH requirements, the **Research Strategy** section should exclude an Innovation component and should instead focus on articulating the scientific problem and the underlying premise on which it is based as part of the **Significance** section; it should also focus on the methods and experiments that are proposed to achieve the research goals of the proposal as part of the **Approach** section. The **Approach** section should place less emphasis on methodological details and more emphasis on the rationale and experimental design, anticipated outcomes, and potential experimental pitfalls. This section should accommodate unexpected findings and alternative strategies should be articulated. **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 F30 or F31 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 F30 or F31 grant applications submitted by other students who have successfully received a fellowship to get a sense of what is included in an application.

The Chair of the O&E committee (or a representative) 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. Students may seek feedback from their committee on their Specific Aims. 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, (1) such interactions should be restricted to seeking information on the strengths and weaknesses of experimental approaches, (2) 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 members of their laboratory, or other faculty, and (3) students are free to allow other graduate students and postdocs outside of their laboratory 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 (within 1-2 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 and/or topics covered in their required courses. 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 (but not students, postdocs or others from their host laboratory) 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 1 month 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 MB2 course duties, or they may choose to assist with another course; in the latter case, the student should seek permission from the Program Director (please send a short description of the course and a listing of the teaching assistant 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. Also for School of Medicine students, the same faculty member

cannot act as the advisor and dissertation committee chair. If the student is affiliated with Pitt's Dietrich School of Arts & Sciences, all committee members must have Graduate Faculty Status, and all of the committee members cannot be from the same department. 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. 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 of the Molecular Biophysics Seminar 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, each student is required to complete at least six credits of elective coursework and those which are selected, must be justified in writing and approved by the Program Director.

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
- Active participation in MBSB Seminar
- Active participation in Data & Literature Club (Spring Semester)
- Successful completion of required core courses

Year II:

- 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.
- Active participation in Data and Literature until the requirement of 7 semesters has been met
- 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), CV, statement of research interests, and three letters of recommendation to the Program Director, who will send the request to the Admissions 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 your base stipend, individual health insurance (the option to purchase dental, vision, or medical insurance for a dependent is available for an additional cost), tuition remission, and a one-time $2,000 educational enrichment account if enrolled at the University of Pittsburgh. If enrolled at Carnegie Mellon, you will receive a funding package of your base stipend, tuition remission, and a one-time $2,000 educational enrichment account. In this case, stipend amounts will be increased to cover the cost for graduate student health insurance at Carnegie Mellon. 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 able to access your one-time $2,000 Educational Enrichment Account beginning the first day of your appointment (September 1, 2021). You will have two years to use the fund; therefore, the account will expire August 31, 2023. Purchases made prior to September 1, 2021 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.