GRADUATE PROGRAM IN MOLECULAR PHARMACOLOGY & PHYSIOLOGY

I. Governance .................................................................2

II. Admission .................................................................3

III. Counseling ..............................................................3

IV. Course of Study .........................................................3

V. Student Seminars ......................................................6

VI. Teaching .................................................................6

VII. Research ...............................................................7

VIII. Preliminary Research Examination .........................8

IX. Ph.D. Thesis ..............................................................9

X. Financial support ......................................................10

XI. Masters Degrees ......................................................10

XII. M.D.-Ph.D. Degree ..................................................11

XIII. Leave of Absence ....................................................11

XIV. Dismissal .............................................................12
GRADUATE PROGRAM IN MOLECULAR PHARMACOLOGY & PHYSIOLOGY

The Graduate Program in Molecular Pharmacology and Physiology offers advanced training appropriate for academic and research careers in fields of biology and medical sciences that include cellular, molecular, comparative, and organ systems pharmacology and physiology. Admission is ordinarily limited to applicants for the Ph.D. degree. The department also has two other graduate programs: Biomedical Engineering and Biotechnology.

To fulfill Ph.D. requirements students must earn an A or B in required courses, pass a preliminary research examination according to established schedules, complete and publicly defend a doctoral dissertation, and participate in the undergraduate and graduate teaching programs of the Division of Biology and Medicine. Attainment of the Ph.D. degree normally requires four to five years for Ph.D. candidates and three to four years of graduate work for M.D./Ph.D. candidates.

I. Governance

The Graduate Program in Molecular Pharmacology and Physiology, a component of the Graduate Programs of the Division of Biology and Medicine, is administered by the Program Director, a standing Graduate Program Committee, and an ad hoc Thesis Committee for each graduate student, as described below.

The Graduate Program Committee is composed of the current Graduate Program Director, the Chair of the Department of Molecular Pharmacology, Physiology & Biotechnology (MPPB), and two additional faculty members chosen by the Program Director and Chair. The Program Director is a faculty member appointed by the Dean of Biology and Medicine, or designate, upon recommendation by the Chair for a term of three years, renewable. The Graduate Program Committee is responsible for decisions related to resource allocations and policy, admissions recommendations to the Graduate School, graduate curriculum decisions, and designation of faculty as trainers or members within the Graduate Program, as outlined below. Input from Graduate Program faculty is considered in the decision processes of the Graduate Program Committee.

The faculty of the Graduate Program will be divided, with respect to graduate training, into two categories, members and trainers.

Members will have an active research interest in the areas encompassed by the Program. They will participate in the activities of the Program by involvement in an upper level course, or by attending program seminars or journal clubs, or by serving on ad hoc committees. They may serve as Thesis Advisors for Masters students.

Trainers are faculty who may serve as Thesis Advisors for Ph.D. students. Trainers must conduct an active research program and must be prepared to commit the time and effort required to supervise the student’s research. They need to commit to providing the financial resources to support the graduate student’s research project and their academic year and summer stipend. Ph.D. training is most appropriate in an environment where the student can interact with other active investigators and graduate students.
Potential members and trainers are proposed to the Graduate Program Committee by existing trainers and members, who will provide the committee with documentation of the candidates' credentials. Designation of faculty status as a member or trainer is made on the basis of the credentials, subject to review every three years.

II. Admission

Entering students are expected to have strong undergraduate qualifications in mathematics, physics, and chemistry as well as in biological sciences. Typically, incoming students will have at least two years of college chemistry and biology and one year of calculus and physics. Students who are admitted without having sufficient background in all of these topics will be encouraged to take the appropriate introductory level courses at Brown before enrolling in advanced courses in the respective area.

The Graduate Program Committee will make recommendations to the full Graduate Program faculty for interviews and acceptance after the applications have been made available for review by the faculty, and opinions solicited from the faculty.

III. Counseling

Until the Thesis Committee is selected, counseling on academic matters and review of student progress will be carried out by the Graduate Program Committee, especially the Program Director. This committee will advise the student on academic matters and review the student’s progress each semester until the Thesis Committee is selected (see below).

IV. Course of Study

The University requires 24 course credits for graduation at the Ph.D. level, of which a maximum of 8 can be transferred from other institutions. Courses must be taken for a grade rather than on a credit/no credit basis. Additionally, students in the M.D./Ph.D. program can receive 8 credits for satisfactory completion of the first two years of the Program in Medicine.

The success of students depends heavily on the consultation between the students and their advisory committees.

Curriculum Guidelines for the Ph.D. in Molecular Pharmacology and Physiology

Attaining proficiency in the MPP core areas -- Entering graduate students in the MPP Ph.D. Program are expected to have, or to acquire, proficiency in the areas central to the Program’s curriculum (pharmacology and physiology). This proficiency should be established by the end of the first year of graduate study, and is based on three specific required courses. Proficiency in the core areas of the MPP Program is gained by taking the MPP core course – BIOL2170, "Molecular Pharmacology & Physiology". In addition, proficiency in quantitative skills is required. This requirement is met by taking one of four courses in quantitative methods: BIOL2010 “Quantitative Approaches in Biology”, CLPS2906 "Experimental Design", PHP2510 "Principles of Biostatistics and Data Analysis" or APMA2610 "Recent Applications of
Probability and Statistics”. A third required course, **BIOL2940A** ("Molecular Pharmacology & Physiology Seminar"), is a career development course taken by all first-year MPP students.

**MPP graduate course work** -- Every MPP doctoral student will be expected to successfully complete a total of **five** courses, usually within the first three semesters. Students will acquire proficiency in the areas central to the MPP curriculum through course work at Brown unless equivalent qualifications are evident from advanced course work completed at previously attended academic institutions. Three of the five courses must be graduate-level courses (i.e., at least at the 2000 level), and this requirement is met by the required courses listed above (BIOL2170, BIOL2940A and the quantitative methods course). The remaining two required courses can be chosen by the student in consultation with the Program Director and/or the Graduate Program Committee and Thesis Advisor, based on the student's general research direction and goals, and their expected thesis research area. In addition to taking the five required courses, students may also increase their breadth of understanding in MPP areas by taking additional courses as electives, possibly on an audit basis, throughout their stay in the MPP Graduate Program. These electives may include seminars or lecture courses at the advanced undergraduate (1000-level) or graduate (2000-level) level. If the same or similar courses are offered as 1000 or 2000 level courses, the 2000-level course should be chosen.

Students must pass all five required courses with at least a B grade or the equivalent performance. Courses taken S/NC must be passed with at least B-level performance as evaluated by the instructor. If B-level performance is not attained in a required course, the student will be placed on academic probation and it will be at the discretion of the MPP Graduate Program Committee to decide whether the student must retake the course or if the requirement may be satisfied in some other way. If less than a B-level performance is attained in two required courses, the Graduate Program Committee will decide whether the student should be given the option of taking two more courses or will be expelled from the Program. If B-level performance is not attained in three required courses, the student will be expelled from the Program.

During a meeting with the Program Director or the Graduate Program Committee just before the beginning of each semester, each student will propose courses to be taken. In preparation for these meetings, it is suggested that first-year students contact the faculty members with whom they may be interested in performing their laboratory research rotations to discuss any specific courses that are deemed necessary, or that would be appropriate, for the intended area of research. The final (fifth) required course, usually taken in semester 3 or 4, should be selected to maximize preparation for a successful PhD, and should be selected in consultation with the student’s Thesis Advisor.

**Students entering with advanced course work** -- To help place students in appropriate MPP core courses, students entering with previous graduate level training should, before coming to Brown, submit to the Program Director descriptions(s) of the course(s) or equivalent experience. These descriptions should include a syllabus or list of topics, the name(s) of the text(s) or readings, the nature of laboratory experience, the duration and number of weekly hours in the course, and any other information that may be helpful. This information will be evaluated by faculty designated by the Program Director, from the respective subject areas, who will recommend whether the student should take a basic course, a more advanced
course, or be deemed proficient in that area without additional course work. The recommendations of the faculty evaluators will form part of the basis for the pre-registration discussion between the student and the Program Director or Graduate Program Committee. Students entering the Program with a Master's Degree in the area of molecular biology, cellular biology, or biochemistry will work with the Program Director or Graduate Program Committee to ensure that their course work, and overlap with previous courses, is minimized.

**Course work and lab rotations to be accomplished during the first year at Brown University** - In their first semester in the Program, students must establish proficiency in the core areas of the MPP Graduate Program (pharmacology and physiology), as stated above. In addition, one or two of the three required lab rotations will also be performed in this first semester. Thus, in the first semester of the first year, each MPP student will take the required course, BIOL2170, one to two research rotations as Graduate Independent Study (BIOL2980), and one elective course or one of the recommended quantitative methods courses, completing the total full-time load of 4 credits for the semester (the student must select a double credit for BIOL2980 when registering on Banner). During the second semester, the students will take BIOL2940A and either an elective or one of the quantitative methods courses, as well as two credits of Graduate Independent Study (BIOL2980), as one to two research rotations. During the first and second semesters, the Program Director is selected as the instructor for BIOL2980, and he/she collects input from the respective research rotation advisors in assigning the course grade; in subsequent semesters, each student’s Thesis Advisor is indicated as the instructor for BIOL2980, and assigns the grade directly. In addition to the above courses, each student will take the research ethics course described below, which is required, but does not count for credit; registration for this course is via response to an email that each student will receive from the Office of Graduate and Postdoctoral Studies, Division of Biology & Medicine. Thus, the course plan for the first year at Brown should look like this:

**Semester I:**  
BIOL2170  
An elective course or a required quantitative methods course (see above)  
Two units of BIOL2980 (taken as 1 to 2 research rotations)  
Responsible Conduct for Research (RCR, see below)

**Semester II:**  
An elective course or a required quantitative methods course (see above)  
BIOL2940A  
Two units of BIOL2980 (taken as 1 to 2 consecutive research rotations)

The second elective course required to fulfill the 5-course minimum will be taken in one of the subsequent semesters, usually the 3rd or 4th semester, along with thesis research.

**Training in Research Ethics** -- In addition to the MPP core courses, the ethics course offered by the Division of Biology and Medicine, entitled “Responsible Conduct for Research”, must be successfully passed in the 1st semester, and its refresher course passed in the 4th year. MPP students will receive emails from the Division’s Office of Graduate and Postdoctoral Studies regarding scheduling and sign-up procedures for the course.
**NSF graduate fellowship application.** All 1st year graduate students are required to prepare an NSF Graduate Research Fellowship Program (GRFP) Application (deadline typically in early November) if they are eligible. However, some students are not eligible (e.g., foreign students and those who hold masters degrees); these students are required to seek out and apply for other fellowships for which they are eligible. An informal NSF graduate fellowship application workshop will be held by the Program Director and must be taken by all first year MPP students. This workshop series (~4-5 meetings) also provides a first introduction into fellowship applications and grant writing. In addition, fellowship workshops will be offered by the Graduate School, and weekly email updates provide information of various other types of fellowships for which MPP students are eligible ("Graduate and Postdoc Studies Weekly Update"). Finally, the Graduate and Postdoctoral Studies Office (Division of Biology & Medicine), can provide critical help in this regard through individual meetings arranged with her by the students.

Students who are successful in obtaining their own individual fellowships are generally eligible for additional compensation in the form of a stipend bonus from the Division of Biology & Medicine, as well as additional funds from the MPP Graduate Program to spend on research-related expenses, such as laptops and research supplies.

**V. Student Seminars**

Graduate students are required to attend and participate in weekly MPPB departmental seminars, and are expected to participate in relevant colloquia and journal club activities of the MPP Program and other graduate programs, depending on the relevance to the individual student’s research interests. For example, students are encouraged to attend the “Bench to Bedside” lecture series organized by the Department of Neuroscience to receive an initial introduction to translational research. Students are also expected to attend the thesis defense seminars of other MPP students.

In the spring of the first year, each student will present a brief departmental seminar on a research rotation experience, in addition to presenting a seminar in class in BIOL2940A. In addition, each student must present one full-length MPPB departmental seminar within one year after passing the Preliminary Research Exam. This must be based on the student’s original research, and should also review relevant background research to show familiarity with the literature.

**VI. Teaching**

Each student is required to serve as a teaching assistant for one semester-long course. Extensive prior teaching experience may be applicable toward fulfillment of the teaching requirement, with permission of the Program Director, in consultation with the Graduate Program Committee. The teaching requirement may be fulfilled only by teaching in courses in which graduate students conduct a discussion or laboratory section or present a small number of lectures.
Foreign students must obtain certification from the Center for Language Studies
(English for International Teaching Assistants) before they can serve as teaching assistants.
Students will have until the end of the fall semester of their second year to demonstrate
proficiency in English and obtain certification from the Center for Language Studies (Brown
University requirement). Each student must be certified at level 2 or better to meet the
Program requirements. It is the responsibility of each international student to schedule an
evaluation with the ESL office upon arrival at Brown and to accomplish the required proficiency
within the first year of graduate studies. If the student’s command of spoken English does not
meet this proficiency, the student must enroll in the appropriate ESL course(s) recommended
by the office of English for International Teaching Assistants. For further information, contact
the coordinator for the English for International Teaching Assistants program, Center for
Language Studies, Brown University; or by phone at 863-2546, or 863-3043. Failing to meet
the English proficiency requirement is grounds for dismissal from the MPP graduate program.

VII. Research

Students are required to participate in research rotations in at least three different labs. These
rotations must be finished by the end of the 2nd semester of the first year. A laboratory rotation
generally takes the form of the graduate course, BIOL2980, Graduate Independent Study.
Rotations provide an opportunity to gain exposure to different techniques and ways of thinking
about scientific problems. All three rotations are carried out during the fall and spring semester
of the first year, running 4-8 weeks each. Rotations are a crucial part of the first academic
year. They will allow the student and trainer to see how well they work together, and whether
there is a good fit between the student and the specific field of research. As mentioned above,
students in the MPP program will need to present research performed during one of their
rotations during a brief departmental seminar; they will receive oral feedback from the MPP
Program Director and other faculty trainers in attendance. Before starting a research rotation,
each student should discuss the amount of time to be spent in the lab, the specific projects to
work on, etc., with the relevant MPP trainer. Each student should have a realistic idea of what
he or she should accomplish during the rotation. Rotations are a critical part of the first
academic year, and evaluations of the rotations are at least as critical as the students' performance in regular courses.

The choice of a Ph.D. Thesis Advisor and research area will be made no later than by
the end of the second semester. The most important factor for choosing a laboratory is the
professor’s ability to train and challenge the student to do science in a stimulating atmosphere.
The intellectual environment of the laboratory and the dynamics of the interaction with the
mentor and student should be foremost in this decision. These considerations should be at
least as important as the scientific area of choice. The student is advised to talk with faculty
trainers before choosing his/her laboratory to determine the amount of professor/student
interaction, teaching philosophies, placement of laboratory alumni in the research field after
leaving the laboratory, and future scientific interests. Further, students are advised to talk with
their peers who have already worked in the different labs to get a feel for the environment.

The student will officially notify the MPP Graduate Program Director in writing of his/her
decision once there is an agreement with a particular trainer who will serve as that student's
Thesis Advisor. Failure to be placed into a graduate trainer’s laboratory by the end of the second semester is grounds for dismissal from the MPP Graduate Program.

VIII. Preliminary Research Examination

By the end of semester 4, the student will submit a written proposal for thesis research, which will form the basis of an oral, Preliminary Examination (sometimes called "Qualifying Exam"). The exam will consist of a brief oral presentation (20-30 minutes) of the proposal by the student followed by discussion of the thesis proposal with the examining committee (designated the Thesis Committee). Written notification of successful completion of the Preliminary Examination will be sent by the chair of the Thesis Committee to the Program Director for inclusion in the student's record.

The Thesis Committee shall consist of the Thesis Advisor, three other members of the Brown Faculty, and an authority in the area of the thesis research from another institution. The Thesis Committee should not be chaired by the student’s Thesis Advisor. If a committee member cannot attend the exam, his/her written critique should be available to the committee at least one week in advance. Members of the committee will be asked to serve by the student after being selected jointly by the advisor and the student (the outside member of the committee is often invited by the Thesis Advisor, rather than by the student, depending on whether the student already knows this outside person). The Thesis Advisor should send a memo to the Program Director listing the membership of the committee, for inclusion in the student's files. The student should also schedule the meeting times of this committee.

The thesis proposal should be no more than 10 single-spaced pages in length. This document will be written in the style of an NIH predoctoral research grant proposal, including sections on specific aims and goals, significance, background, proposed methods and experimental approaches, interpretation of expected results, and a report on preliminary progress. A final draft of the thesis proposal shall be provided to all Thesis Committee members at least two weeks prior to the date of the oral examination. The proposal is to be developed by the student, with only minimal involvement of the research advisor or others in the laboratory. It is strongly recommended that the student, when possible, submit the written document as a predoctoral fellowship application to a funding agency such as the NIH after completion of the Preliminary Examination.

Major goals for this examination are to evaluate the student’s comprehension of the scientific literature in the area of the thesis research as well as in related areas and to evaluate the student’s ability to define scientific questions and to develop experimental strategies. However, this examination also is an opportunity to obtain initial input from the Thesis Committee on the feasibility of the project and possible improvements to the research plan.

Research Progress Meetings and Reports after the Preliminary Examination

The student should arrange a meeting of the Brown affiliated members of the Thesis Committee with the student at least once a year after completion of the Preliminary Examination. Additional meetings per year are recommended, and may be required by the
Program Director or Graduate Program Committee, especially for students beyond year 3 of the Program. The purpose of the Thesis Committee is to follow the progress of the student, to help the student with difficulties encountered in the dissertation research, and to aid with the evolution of the project. These meetings may be scheduled for the intersession between semesters in the academic year, a time when both faculty and students are likely to be available and free of teaching responsibilities. The student will prepare a brief (about one page) written report of progress and proposed work (and proposed timeline for completion, for students after the 3rd year) to be distributed to committee members prior to each meeting. After the committee meeting, a copy of the student's annual progress report should be sent to the Program Director and Program Coordinator (Carol Folan) for inclusion in the student's file. This report should contain any changes suggested by the Thesis Committee at the time of the meeting. In addition, the MPP Graduate Program Director may schedule occasional meetings with the student, the Thesis Advisor, and/or the full Thesis Committee to assess progress.

IX. Ph.D. Thesis

As stated above, the Thesis Committee consists of the Thesis Advisor, three other members of the Brown faculty, and a reader external to Brown. The doctoral thesis should represent a comprehensive summation of the student's total research effort. It is expected to contribute significantly to the field of study and to be of sufficient quality to merit publication in a refereed journal. The thesis can be presented in either of two formats. The first format, which may be used by any degree candidate, should contain the following elements:

a) Abstract - less than 350 words summarizing the thesis problem, methods used to solve the problem, the results, and conclusions.

b) Introduction - a comprehensive review of the field and reasons for performing the research.

c) Methods and Results - a description of the research performed.

d) Discussion - an evaluation of the contribution of the thesis research to the field of study and consideration of future directions

The second format may only be used by candidates whose thesis work forms the basis for papers accepted for publication in refereed journals. In this case, the published papers (or relevant portions of the manuscripts) may be included as specific chapters within the Results section of the thesis. Unpublished results can then be included in separate chapters of the Results section. Although each published paper will contain specific methods, it is also useful to include a section in the thesis that provides general methods, especially if some results chapters are unpublished. Otherwise the format should be the same as that given above; i.e., it should contain a complete Abstract, Introduction, and Discussion.

If portions of the student's work have been done in collaboration with other investigators, the candidate should explicitly state his/her contribution to the work. For theses that follow the second format, this is generally accomplished by preceding the relevant results chapter with a page that states which parts of the following published paper were performed by the student and which parts were performed by the other authors. Detailed instructions on
preparation and format of the Ph.D. dissertation should be obtained from the Graduate School.

In the last few months of the student's dissertation research, he or she will meet with the Thesis Committee ("pre-defense meeting") to present a preview of what will appear in the thesis, and to set an approximate date for the Thesis Defense. At the Defense, the student will present his/her work in a seminar, and then undergo a closed-door oral examination attended by members of the Thesis Committee and other faculty members who choose to participate. The thesis must be submitted to the Thesis Committee at least 2 weeks prior to the Thesis Defense. The student will schedule the Defense and notify the Program Director and Program Coordinator (Carol Folan), at least one month before the defense; the Program Coordinator will notify all program faculty at least one week before the defense. Faculty members are encouraged to attend the Defense seminar, and participate in the examination.

X. Financial Support

Graduate students who are candidates for the Ph.D. are generally accepted into the Program of Molecular Pharmacology & Physiology with a commitment of financial support while their research and academic studies progress satisfactorily (up to 5 years). Divisional support is provided during the first 12 months in which the student is taking courses and laboratory rotations. During the summer, the student is expected to begin research in the laboratory of a graduate trainer. Second year students typically receive support for one semester as teaching assistants. Faculty who accept graduate students into their laboratories under the auspices of the MPP Program need to provide both academic year and summer support for their students who have fulfilled the minimum teaching requirement, and who are not receiving support from other sources. This support will include stipends for both academic year and summer; one tuition credit or registration fee per semester as appropriate; health insurance; and the health services fee.

Any student who has passed the Preliminary Research Examination may request up to $400/year from the Program Director who administers the Graduate Program budget for travel funds to attend scientific meetings if the student is presenting an abstract at the meeting. Students in their second year and beyond also are eligible to apply for additional travel funds from the Division of Biology & Medicine (Office of Graduate and Postdoctoral Studies).

Students who obtain individual external fellowships are also eligible for additional compensation (see above, NSF graduate fellowship application).

XI. Masters Degrees

Currently, the MPP Graduate Program admits Brown's 5th-year Masters students, but not external masters students. Masters students are not eligible for financial aid. A Masters degree requires 8 course credits, and one of these must be the main MPP core course, BIOL 2170 (Molecular Pharmacology and Physiology). Other courses for the Masters degree are decided in consultation with the MPP Graduate Program Committee to reflect the individual student's
research/career interests. Students must pass all courses with at least a B grade; courses taken S/NC must be passed with at least B-level performance as evaluated by the instructor. There is no teaching requirement for a Masters degree.

**M.S. Degree**

In addition to Divisional requirements, a written thesis based on original research must be completed and accepted by a committee consisting of the research advisor plus two additional members of the Brown faculty.

**M.A. Degree**

A written thesis is not required. There is no teaching requirement for the M.A. degree.

**XII. M.D./Ph.D. Degree**

Students in Brown's M.D./Ph.D. Program may participate in the MPP Graduate Program. These students must complete all of the MPP Program requirements specified for the Ph.D. degree, except that they are not required to serve as teaching assistants, and may receive course credit for the first 2 years of medical school, including exemption from our core courses BIOI2170, the quantitative methods course, and the 2 elective courses. They are encouraged to take BIOI2940A for their scientific career development.

**XIII. Leave of Absence**

For the leave of absence the MPP graduate program follows the general guidelines of the Brown University graduate school. During the course of graduate study, a student may need to request a leave of absence. Applications for leaves of absence should be sent to the MPP Graduate Program Director before December 1st and thereafter to the Graduate School by December 15th of the year preceding the academic year in which the leave is to be taken. Failure to inform the Graduate School means that the student will still be considered active and will be billed for tuition. The Graduate Program Director must approve all leave of absence applications, in consultation with the Graduate Program Committee.

Students must use the standard form to request a leave and should attach a separate note explaining the reason for their request. The Graduate Program Director should sign the form to indicate approval and forward it to the Graduate School for approval by the Dean. Leaves of absence are normally granted for one year. To return to active status, students must notify the Graduate School in writing by May 1st for a fall-semester return or November 1st for a spring-semester return. The Graduate Program Director should be aware that granting a leave implies that the program will be willing to readmit the student, though sometimes only if certain conditions are met. Any such conditions should be put in writing and clearly understood by all parties. Students on leave do not have access to the library or other facilities, including the University's electronic resources. If the student is an alumna/us (such as a master's degree holder) he or she may use the library under that status. Borrowing privileges may also be purchased for a nominal fee. A student who has taken a leave of absence should write to the
MPP Graduate Program Director requesting readmission. The Program Director should then endorse and forward the request to the Graduate School for approval by the Dean.

XIV. Dismissal

A student may be dismissed from the Graduate Program for academic or non-academic reasons. The Graduate Program Committee will review each case and place its recommendation before the full faculty convened by the Program Director. Two thirds of the faculty will constitute a quorum and a decision to accept the recommendation of the Graduate Program Committee will require a favorable majority vote. Appeal of such decisions is to the Dean of the Graduate School.