MCB The Molecular and Cellular Biology Graduate Program

DARTMOUTH

Program Rules and Regulations

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Acronyms used within Rules and Regulations:

MCB - Molecular and Cellular Biology Program
PEMM - Program in Experimental Molecular Medicine
AC - Advisory Committee
GC - Graduate Committee
QE - Qualifying Exam
RP - Research in Progress
GRAD - Guarini School of Graduate and Advanced Studies
RIP - Research in Progress seminar
TA - Teaching Assignment
GENE - Molecular and Systems Biology (formerly Genetics)
BIOC - Biochemistry and Cellular Biology
MICR - Microbiology & Immunology
BIOL - Biological Sciences

Molecular and Cellular Biology Graduate Program at Dartmouth

Overview and Statement of Purpose

The primary goal of the Molecular and Cellular Biology (MCB) Graduate Program at Dartmouth is the training of students to be highly qualified for productive careers in research and teaching in molecular and cellular biology. Only students who intend to pursue the Ph.D. degree full-time are accepted into the program. The program of study begins with research rotations, a set of required courses, and advanced electives. Training culminates in the production of a publishable thesis based on original research in the student's chosen field of investigation. Each student is required to work on the thesis under the supervision of a Thesis Advisor, and this association will determine, to a large extent, the nature of the student's individual course of study. The guidelines that follow have been adopted by the MCB Program faculty to ensure that each student completing the graduate program will have acquired the necessary skills and knowledge to be effective in research and teaching in their chosen discipline within the MCB Program.

Note that in the sections following, the term 'first year student' is used to describe a student entering the program with no advanced degree and no experience other than that gained in earning a bachelor's degree. Under no circumstances may a first-year student begin satisfying the requirements described in this document prior to the Fall term of their first year in the program. Also, the word 'faculty' where not specified otherwise, refers to MCB Program faculty.

All students are expected to adhere to the Honor Principle and the Student Code of Conduct as described in the Dartmouth Graduate Student Handbook.

I. ADVISING AND RESEARCH REQUIREMENTS – FIRST YEAR

A. Research Requirements for First Year Graduate Students

In September preceding the start of the Fall term, entering students will meet individually with a faculty member of the MCB Graduate Committee. The purpose of this initial meeting is to inform the students of program expectations and regulations and to begin the process of selection of laboratories for research rotations, courses, etc. During their first year in the program, graduate students are required to do three research rotations under the supervision of three different program faculty members; each rotation will be of a term's duration (i.e. approximately two and a half to three months, covering the periods Sept-Nov, Dec-Feb, Mar-May). Students are strongly encouraged to read papers by faculty whose research is of particular interest to them and to call or write those faculty members during the summer to discuss the possibility of a rotation. Before the start of the Fall term, therefore, each student needs to contact faculty members whose research they find coincident with their own interests to find out if it is possible to rotate in their laboratories. Students will each submit to the Graduate Committee three choices for Fall term research rotation sponsors, in rank order of preference. The Graduate Committee will then match students with their Fall term research rotation advisor making every effort to give students and faculty their first choice. The Graduate Committee will perform this function using the following considerations:

1. Students may perform research rotations only in laboratories of faculty who have made it clear to the Graduate Committee that they have the appropriate research grant funds or departmental resources at their disposal to fund the costs of the rotation (expendable supplies and potential thesis research).
2. The Graduate Committee will solicit information from each faculty member in the

program regarding their interests in sponsoring rotation students and be guided by this faculty input when assigning rotations.

3. Realizing that ideas, impressions, attitudes, and expectations change with time, the Graduate Committee recognizes that only the first (i.e. the Fall term) rotation is to be arranged prior to the beginning of the Fall term. The second and third rotations (Winter and Spring terms) will be arranged (and assigned by the Graduate Committee) during the final week of the preceding term using procedures identical to those employed for the choosing of Fall term rotations.

It should be emphasized that neither the student nor the faculty member is to regard any of the three research rotations as permanent. Indeed, students are required to perform three such rotations before finally deciding on a Thesis Advisor from among the three rotation lab advisors. Students and faculty are not to arrange the choice of their thesis lab until the last two weeks of the third rotation; the precise time when it is appropriate to discuss permanent arrangements will be announced to students and faculty by the Graduate Committee. Once the thesis lab arrangements are announced, students and faculty will be asked to sign and submit a letter of agreement, to the Graduate Committee confirming the match and the program designation (letter will be sent by the MCB Office to the student). The final assignment of a student to a thesis lab requires the approval of the Graduate Committee.

At the end of each rotation, the rotation advisor will submit a grade of Credit (CR) or No Credit (NC). A grade of NC for research rotation is given only if there are serious deficiencies in student performance and requires approval of the Graduate Committee.

Grading System

MCB core and elective courses are graded on a HP (High Pass), P (Pass), LP (Low Pass), NC (No Credit) scale. Core classes required of all first-year students. Fall-term core and Winter-term core are one term long each. Students will receive a grade for each term's core course. Spring-term core is divided into three sections consisting of course modules. Each Spring module will be graded individually resulting in three grades for the Spring term. First year students are required to complete three modules – one module in each 1/3 of the term - resulting in three grades for the Spring term core.

Grades of "LP" or "NC" in research rotations, journal club, thesis research, or in course work, (collectively referred to as ‘course' or ‘courses' below) have serious consequences, as follows:

One grade of "LP" or "NC" in any term in any course results in the student immediately being placed on probation. For the Spring term core course, a LP in two modules is equivalent to a LP for the term and a NC in one module is equivalent to a NC for the term. Once placed on probation, any one of the following three conditions will constitute grounds for immediate separation from the MCB Program:

1. A grade of "NC" earned in any course in any subsequent term.

2. A grade of "LP" or “NC” in any term of the core course.

3. An aggregate total of two additional "LPs" earned in any subsequent courses.

B. Student Choosing to Enter the MCB Program from the PEMM Program

During the second and third rotations, students may rotate with any faculty member that is a member of the PEMM or MCB Programs. PEMM students may also rotate with MCB faculty

members. In the event that a student admitted into the PEMM Program chooses to pursue their thesis research with a faculty member in the MCB Program, the student and advisor will write a letter to the MCB Graduate Committee informing them that the student requests transfer to MCB. If approved, the student will join the MCB Program and be required to fulfill all requirements of MCB students (e.g. one term of teaching, six terms of courses, journal clubs, annual RIPs, qualifying exam, etc.) as outlined in these Rules and Regulations. The PEMM core course taken during the first year will be counted as part of the MCB course requirement for the Ph.D. However, the MCB Graduate Committee, in consultation with the student's advisor, may require a section of the MCB core course if it is thought that this would be critical for the student's scientific training in a particular area. The student will not be required to take more than the total number of standard required courses.

MCB students who join the lab of a faculty member with dual membership (membership of both MCB and PEMM) will remain a MCB student and bound by the requirements of the MCB Program.

C. Thesis Advisor and the Advisory Committee

By the end of the Spring term of the first year of graduate study (approximately June 1), each student must have arranged with a member of the MCB faculty (from among the three formal research rotation advisors) to serve as Thesis Advisor and research sponsor.

Choice of a Thesis Advisor may be delayed by one term under special circumstances in which a student petitions the Graduate Committee for a fourth research rotation; in this case the fourth research rotation will occur during the summer of the student's first year in the program. Students not able to find a suitable or willing advisor from among MCB Program faculty at the end of their research rotations will be separated from the program.

The Thesis Advisor plus two other faculty members, chosen by the student in consultation with the Thesis Advisor and with their agreement, will become the student's Advisory Committee (AC). The two Advisory Committee members are chosen to serve on the student's Qualifying Exam Committee first, then become the student's Advisory Committee. The student's Thesis Advisor will serve as AC Chair. Normally, the AC will be composed of MCB faculty members. However, where appropriate, one member of the AC may be a non-MCB faculty member. The committee should be assembled to avoid potential or perceived conflicts of interest between faculty members and between faculty members and the graduate student. Such conflicts would include personal or financial relationships. Final approval by the Graduate Committee of the composition of the AC is required, as are any subsequent changes in the composition of the AC. The composition of the AC must be approved prior to the student's first research in progress (RIP) seminar.

D. Functions of the Advisory Committee (AC)

The duties and purpose of the AC are to:

1. Meet with the student at least once yearly to assess progress.
2. Attend the student's annual research-in-progress seminar (RIP). The AC should meet soon

after the student's RIP.

3. Advise the student as to research direction, course selection, TA assignment, etc. Advise the student of course requirements and to select, with the student, an academic program and timetable suitable for the student's chosen interests.
4. Review and sign a brief annual report written by the student summarizing the progress and performance in the program. The report form should include an evaluation of the student's progress in developing a thesis research project that meets the criteria outlined in Section II.E. below, and should describe any concerns about the student's trajectory. This will serve as part of the formal record of the student's graduate education.
5. Ensure that the student develops the ability to communicate ideas and knowledge to others in seminar-style presentations. This will normally be accomplished through experiences gained in courses, journal clubs, Research-In-Progress seminars, lab meetings, etc.
6. Provide advice concerning the time and subject of the qualifying examination, following procedures specified by the Program (see Section II.D. below).
7. Mediate disputes between student and Thesis Advisor. In the event that either the student or the Thesis Advisor desires to end the student-advisor relationship, then the AC must play an active role, particularly if the decision is not a mutual one between the student and Thesis Advisor.

It is the responsibility of the student to inform the AC about the dates of their Research In Progress seminars (RIP), to schedule meetings with the AC, at least once annually and to provide a document summarizing progress (template available from the MCB Office) and goals for faculty to sign that confirms that the committee has met. The student should come to the meeting with an outline of research progress to date and outlining future plans. Once approved by the AC, this outline should be signed by the student and all members of the AC and submitted to the MCB Office as a report of the annual meeting. The report is due no later than June 30 of each year (defined as the period from July 1 to June 30) in which the student is enrolled for research credit (197-199 or 297-299) in any term. In the event that the report is not filed, the stipend increase that is granted to the student upon successful completion of the qualifying exam will be withheld in increments of $100 a month from July 1 through November 30. In addition, the student will be placed in unsatisfactory standing and the Guarini School of Graduate and Advanced Studies (GRAD) will be notified. The qualifier increase will be restored upon the filing of the report, but the student will forfeit the raise for the months (or parts thereof) during which the report is late. If no report is filed by December 1 of the year it is due, the student will be separated from the MCB Program.

If either the Thesis Advisor or the student wants to end the relationship, then the following must occur:

a. The reasons for the action must be stated in writing.
b. The AC must be made aware of the issues.
c. The student (or Thesis Advisor) must be given an opportunity to rectify the problems.
d. The conditions that the student must meet to rectify the problem should be approved by the AC and communicated in writing to the student and to the Graduate Committee.

E. Composition and Functions of the Graduate Committee

The Graduate Committee (GC) is composed of program faculty members appointed jointly by the chairs of the programs within MCB. Two faculty members from each of the component programs in MCB (Biology, Biochemistry and Cell Biology, Molecular and Systems Biology, and Microbiology & Immunology) will be appointed to the GC each year by the respective program chairs. Graduate students also serve as members of the GC. In June of each year, the

graduate students in the MCB Program will identify and vote on a slate of candidates to serve on the GC. The GC will then select from this slate one or more graduate students to serve as graduate representatives for the upcoming academic year.

The GC is led by a Chair and a Vice-Chair, both faculty members of the committee chosen jointly by the chairs of the programs within MCB. Each Chair will begin as Vice-Chair while working with the current Chair for one year (July 1 through June 30). The Vice-Chair will then take over the position of Chair for a two-year term with a final year as Consultant to the Chair. The terms for both positions are staggered to provide coverage at all times for the GC. Both the Chair and Vice-Chair positions will rotate among the four component programs.

When a student in the lab of any faculty member of the GC is being discussed by the Committee (academic issues, move to Masters track, research performance, etc.), the faculty member/advisor will recuse him/herself from the GC vote regarding the student. The faculty member/advisor will be present to answer questions and provide background information as appropriate. Should the faculty member/advisor in question be the Chair of the GC, then the Vice-Chair of the GC will preside over the discussion and subsequent vote. The Vice-Chair would then communicate the outcome of the meeting to the student.

The functions and responsibilities of the Graduate Committee are:

1. Oversee the advertising of the MCB Program to potential students, monitor the application process, review applications, conduct interviews of prospective students, and recommend applicants for acceptance to the Dean of GRAD.

2. Approve the composition of each student's AC and approve changes (if any) in the composition of these committees. The Thesis Exam Committee membership will be approved by the GRAD, which has final authority over membership requirements.

3. Serve as an arbitrator for disputes, when required and warranted by the circumstances, should differences arise among members of a student's AC or between a student and one or more members of the student's AC, including the Thesis Advisor.

4. Approve assignment of students as teaching assistants to various courses, as required, in consultation with the faculty teaching these courses.

5. Inform appropriate Program faculty (Thesis Advisor, AC, etc.) when a student is in jeopardy of being separated from the Program (see Section I.C.).

6. Oversee the conduct of the Program, ensure that all the rules agreed to by the program faculty (i.e. those contained in this document) are followed, and determine that each student has specific plans for meeting the requirements of the Program and is successfully making progress toward the Ph.D. degree.

7. Maintain a list of courses that have been approved (by the MCB GC) as appropriate for fulfilling the requirements for elective courses. Faculty wishing to have a new course approved should submit a description of the course to the MCB Office outlining the content, approach, and how students will be evaluated.

F. Transfer Students and Students Holding an Advanced Degree

In some instances, modification in the rules outlined in this document may be made for students entering the MCB Program with an advanced degree (e.g. M.A., M.S.) in molecular and cellular biology (or another appropriate area) or with substantial laboratory research and/or graduate level course experience from another graduate program. In some cases, students may receive a reduction in the requirements for the degree outlined in this document. Such modifications in the requirements will be decided on a case-by-case basis by the GC as the need arises and will be clearly documented by appropriate written documentation that becomes part of the student's formal record of participation in the MCB Program. However, one rule that cannot be waived by the GC is the rule governing three research rotations. The GC can, however, in the case of transfer students who have prior laboratory experience in another graduate program and on a case-by-case basis, shorten the time of the required three rotations to no less than one month for each of the three rotations. Note that students who transfer with a Thesis Advisor who comes to Dartmouth with a new appointment in one of the component programs of the MCB Program are not required to complete three research rotations, as long as they remain in the Thesis Advisor's laboratory. Students who transfer under these circumstances often receive their Ph.D.'s from the prior institution and follow its requirements. However, such students may apply for admission to the MCB Program. In these cases, the GC will decide whether the student can be admitted to the MCB Program, and which MCB requirements they will need to fulfill. Candidates for the Ph.D. degree are required to spend a minimum of either six terms or two academic years in residence in the Program.

G. Departure of Advisor from Dartmouth

There are four distinct options for students should their advisor leave Dartmouth to join another institution. In all circumstances, the student and Thesis Advisor are required to notify the MCB Graduate Committee in writing PRIOR to the move with their decisions.

1. The student may choose to remain in the MCB Program, and transfer to a new lab at Dartmouth. This option requires the naming of a new Thesis Advisor from among the MCB faculty. It is up to the student and new advisor if they would like the outgoing advisor to serve on the student's Advisory Committee.

2. The student may choose to continue to work with the outgoing advisor but remain in the MCB Program and work in Hanover. In that case, a new MCB Thesis Advisor must be named with the original advisor remaining a member of the student's Advisory Committee, attending RIPs, committee meetings, qualifying exam, etc.

3. The third option is that the student would move with the outgoing advisor to the new institution while remaining an MCB student. The student will be required to name a new MCB Dartmouth-based Thesis Advisor, to enroll in graduate research at Dartmouth each term, and to meet all program requirements while studying off-site. The student will be required to return to campus for his/her annual RIP and Advisory Committee meeting with both advisors and complete all course requirements. Also required is the fulfillment of the journal club attendance during Fall, Winter and Spring terms. If the new institution does not have journal clubs or will not allow the MCB student to attend, then the student must petition the MCB Graduate Committee prior to the move to request a waiver of this requirement. Should the move off campus occur prior to the student's completion of the teaching assignment, that requirement may be waived upon the approval of the MCB Graduate Committee.

4. Option four is that the student withdraws from the MCB Program to follow the lab of the

outgoing advisor and join the new institution's program.

II. PROGRAM REQUIREMENTS FOR THE PH.D.

There are eight major requirements for the Ph.D.: (1) Research rotations, (2) courses, (3) one term of teaching, (4) successful completion of the qualifying exam, (5) attendance at program functions, (6) written thesis, (7) thesis seminar and defense, and (8) submission of final thesis. When the research rotations, three-term core course, and qualifying exam have been completed satisfactorily, the student will be advanced to candidacy for the Ph.D. degree. Students can be advanced to candidacy with some coursework outstanding. Specific details relating to these requirements are described below and in the following section. Failure to fulfill these requirements as specified may place a student in unsatisfactory standing, as defined by the GRAD Student Handbook (located on GRAD website under Graduate Registrar and may lead to separation from the program.

Required Research Rotations

Each first-year student is required to perform three research rotations in three different laboratories during the first year in the Program. Rotation assignments will be made by the MCB GC based on ranked choices submitted by both students and faculty. Each rotation will last approximately three months.

B. Course and Grade Requirements

Graduate students are required to perform satisfactorily in ten separate areas in which they receive grades. Every student is required to participate in three research rotations, an approved ethics course, and a three-term core introductory sequence. In addition, each student must earn four additional course credits. One of these four required courses must be a teaching course, assigned by the GC, normally in the student's second year in the Program, and this fulfills the one-term teaching requirement. The remaining three MCB approved elective courses should be chosen in consultation with the student's AC.

The MCB approved list of course offerings can be found on the MCB website. Approved elective courses normally meet for a complete term (about ten weeks) either three times per week for 65 minutes each or twice per week for 100 minutes each or once per week for approximately 3 hours. Thus, a full-term course meets for about 25-30 contact hours per term and counts for one course credit of the required three course credits. Courses completed with a grade of No Credit (NC) will not count toward the three-course requirement.

If a student wishes to take an elective for credit that is not on the approved list or is offered at another institution, the student must petition the MCB GC and obtain approval before the course begins. If the student fails to obtain approval prior to enrolling in the course, elective credit will not be given. Students that transfer from another graduate program may seek approval of courses taken at that institution. Such approval will proceed on a case-by-case basis, but approval must be sought within one year of matriculation into the MCB Program.

Students interested in enrolling in any Masters Program offered at Dartmouth, to run concurrent with their Ph.D. degree studies, must meet certain requirements and receive approval from their Thesis Advisor, Advisory Committee and the MCB Graduate Committee prior to enrolling in the Masters Program. All MCB Program requirements (including three approved elective courses) must be successfully completed before such a request will be considered. Additional courses, after completion of MCB courses and Program requirements, must be approved by the student's

Thesis Advisor and Advisory Committee prior to enrollment. The student will be required to complete the Request for Enrollment in Second Degree Program at Dartmouth form (available from the MCB Office) and have the Thesis Advisor and members of the Advisory Committee sign the form. This completed form must be conveyed to the MCB Office for consideration by the MCB GC.

Students considering an internship or training with an off-campus institution will need to petition the MCB GC for pre-approval. The student must provide information about the internship or training with a specific timeline and its relevance to their research. The student's advisor should provide an email request to the Chair of MCB with specific details about the opportunity. This is only available to students who have at least one year remaining on their thesis research. The student may not receive stipend support, reimbursement, travel expense, etc. from the outside institution during or after the internship/training. Stipend support will continue to be covered by the student's Thesis Advisor.

Some approved electives change topics from year to year. In order to receive course credit for taking the course more than once, the student must receive pre-approval from the GC by presenting documentation demonstrating that the course topics are different with little or no overlap of content.

Some programs within MCB may set additional course requirements, either by requiring specific courses or by requiring the student to select electives from a list that is a subset of the list approved by the GC. In addition, the AC can recommend that a student take more than the minimum required number of courses in order to provide that student with an academic background appropriate for pursuing research in the student's chosen area of investigation. For example, a student studying NMR spectroscopy may require a more extensive background in chemistry than is provided by the minimal course requirements. If such courses are to count towards the three required courses, they must be from the approved course list, or the student and advisor must petition the GC that the course be approved. In all instances where additional courses are suggested, the proper procedure will be for the AC to make a recommendation to the GC, which will have the final authority in this area.

Students with advanced degrees from other U.S. institutions may petition MCB for transfer of up to three course credits from the previous advanced degree. Each petitioned course must in some way parallel an existing approved MCB course. A syllabus for the petitioned course should be provided along with information on the existing MCB course for which the student wants credit. The petition must be received by the MCB Office within one year of completing the outside course or of entering the MCB Program at Dartmouth. The petition will be reviewed by the MCB GC on a case-by-case basis.

C. Seminar, Research in Progress, and Journal Club Attendance

Attendance at three program functions is required of all graduate students in the MCB Program:

1. Students will attend MCB Program seminars such as RIP and departmental seminars. In addition, first year and new transfer MCB students are required to register for Biology 271 - "Research in Progress Colloquium" in the Spring term of their first year in MCB. This course is designed to monitor attendance at RIP seminars throughout the first year of graduate school.

2. Students in their third year and beyond are required to present a RIP seminar each year

(defined as the period from July 1 to June 30) in which the student is enrolled for research credit (Bioc/Biol/Gene/Micr 197-199 or Bioc/Biol/Gene/Micr 297-299) in two or more terms. The order of presentation will be decided by the GC but normally, presentations will begin in the Fall with students who have been in the program for longest period. Reciprocal, mutually agreeable exchanges in RIP assignments in a given year can be made by any pair or group of graduate students with approval of the Thesis Advisors and the MCB Office. In the year in which the student expects to defend his/her thesis and receive the Ph.D., the student must still present a RIP seminar unless the name of the outside examiner and the defense date have been sent to the MCB Office before August 15.

3. Participation in one of the journal club series approved by the GC is also required during the Fall, Winter, and Spring terms. Participation is not required during the term in which a student's Ph.D. defense is scheduled, provided the student notifies the MCB Office of the date of the defense and the name of the external examiner prior to the withdrawal deadline for the course. Choice of a journal club to attend will be made by the student, but some faculty may require students to attend an appropriate journal club during a student's research rotation in their lab, and students who have chosen a thesis lab may be required to attend specific journal club(s) as specified by their Thesis Advisor or AC. It is expected that students, beginning in their second year, will present at least one oral presentation per year in a journal club.

D. Qualifying Exam Procedure

Students will begin to write a Dissertation Proposal as early as possible during their 2nd year. The proposal will outline the student's intended dissertation research plan and be written in cooperation with the Thesis Advisor. Specific details about the procedure for writing the dissertation proposal are provided in the following section. Briefly, the format must follow that of the current NIH format for F31 applications. The dissertation proposal will contain 2-3 aims that address the central questions driving the student's thesis research. For the proposal, at least one aim should be an original conception of the student rather than an aim previously formulated in the thesis lab. The novelty of the student's original aim may be in the hypothesis tested, molecular mechanism evaluated and/or technical approach. The dissertation proposal must be approved by the Thesis Advisor and submitted to the QE by June 1 (between the student's 2nd and 3rd years) but will not be formally assessed by the QE committee nor feedback given on the written proposal.

In parallel, the student will independently conceive of and write a brief abstract describing a Mock Research Idea. The mock research idea must be novel and cannot be based on any project currently being conducted in the student's lab. Hypothesis-based questions, unbiased screening studies, or innovative technique development ideas relevant to molecular and cellular biology are all acceptable. The abstract should include background, significance, a brief description of the idea, and any relevant references. The abstract should be as concise as possible; details should be explained during the oral examination.

The entire qualifying examination (assuming no second attempts) must be completed by October 1st in the Fall of the 3rd year at the latest, and must adhere to the following schedule:

1) The student and Thesis Advisor will select two members of the QE committee no later than March 1 of the student's 2nd year. These two members, after an initial reading of the dissertation proposal, will then recruit a third QE committee member. No more than one QE committee member may be from outside of the MCB Program. The original two members of

the QE committee will continue on to form the student's Thesis Advisory Committee.

2) The dissertation proposal and mock research idea abstract will be simultaneously distributed to the QE committee no later than June 1. No formal assessment, revision or approval of either document is required from the QE. Rather the dissertation proposal and mock research idea will provide topics to be discussed and probed during the oral examination.

3) The student is responsible for scheduling the oral examination meeting. The oral part of the qual exam must be completed no later than October 1 of the student's 3rd.

A majority decision of the QE Committee members is required for a student to pass the exam. If the student does not pass the exam, he or she will have one opportunity to retake the exam within 4 weeks, unless there is a unanimous vote of QE Committee members not to offer a retake.

The MCB Chair, in cooperation with the Thesis Advisor and Department Chair, will determine whether reasons for delay beyond October 1st are acceptable.

Dissertation Proposal Guidelines

The dissertation proposal should explain the questions that the student intends to pursue within the next two to four years of graduate training. The proposal should contain 2-3 specific aims (including one original aim), and rigorously and critically defend the rationale and choice of approach. The proposal is written by the student (in cooperation with the Thesis Advisor) and should conform to the current format for the specific aims and research strategy components of an NIH F31 pre-doctoral fellowship application or NSF pre-doctoral fellowship application format. The student may include preliminary data (appropriately attributed if generated by other workers), but the student may not copy text from any other sources (violation of this rule would be considered plagiarism). The Thesis Advisor should not directly write any portion of the text. The Thesis Advisor is expected to suggest potential avenues for research and provide feedback on grantsmanship for most of the proposal except for the one original specific aim, which must be conceived and written by the student without any input from the Thesis Advisor. This original specific aim should be clearly marked as such in the final document.

The dissertation proposal may be either hypothesis-based or needs/discovery-based, and should clearly describe:

The overarching questions that will be addressed and the reason why this is an important question to answer

The central hypothesis or needs/discovery goal

The specific aims and how they will test/address the central hypothesis

The necessary background information

For each aim, the rationale, experimental approaches, outcomes (both consistent and inconsistent with the hypothesis), interpretation (including controls), and pitfalls

The impact of the research: how will completion of the project change the way scientists look at this area of biology or open up new areas of biology.

Oral Examination Guidelines

1) At the oral examination, the student will present a private, prepared seminar to their QE Committee on their proposed dissertation work (~ 10 slides or 15 minutes total).

2) The student will be assessed for whether they have thought deeply about the dissertation project and taken intellectual ownership for it. The student will be asked many questions about any aspect of the proposal. For example:

   What is the justification for choosing the proposed central hypothesis/ over alternative explanations?

   How familiar is the student with the background literature and the broader context of the field of study?

   Why were particular experiments chosen? How will they be carried out? Which controls will be required? How would particular hypothetical outcomes be interpreted? Are there alternative experimental approaches that might address any gaps.

   If one specific aim cannot be experimentally resolved, will progress be blocked on the other aim(s)?

   Is the student aware of related areas of scientific inquiry?

   Is the student capable of thinking critically and creatively in responding to hypothetical outcomes or unfamiliar experimental concepts?

   Being prepared to successfully answer these questions will require tremendous amounts of reading and synthetic thinking during the preparation of the proposal, but more importantly, throughout the entire period of time working in their lab.

3) The student will also be asked to briefly (~5 minutes) explain and/or illustrate the significance and principle of their Mock Research Idea without prepared slides, as in a chalk talk. A model may be drawn on the board. Again, students will be assessed for their ability to think critically and rigorously when answering experimental and theoretical questions related to their Mock Research Idea.

4) It is recommended that the entire Oral Examination be completed in less than 3 hours, although the QE committee may decide to extend it if necessary.

E. Thesis and Thesis Defense

For the Ph.D. degree, the student shall show competence in original research and shall prepare a doctoral dissertation containing the results of their independent studies. The thesis should present a coherent investigation of an original scientific research question at a level of rigor suitable for publication in a peer-reviewed academic journal. It should also include a thorough and critical analysis of the published literature in the field, and of the methodological and theoretical background of the work. Before beginning to prepare the thesis, the student must obtain approval from the AC. As students begin preparation for the thesis defense, they must contact their program office (Biology, Biochem/Cell Biology, Micro/Immuno, Mole/System Biology). This is essential to help ensure that the student and program work together to follow all graduate school policies so that the student will be able to graduate on their projected date. Students are

advised to visit the School of Graduate and Advanced Studies website for information about thesis preparation and formatting (http://graduate.dartmouth.edu). Upon completion of a thesis approved for defense by the Thesis Advisor, the Thesis Advisor in conjunction with the student will assemble a Thesis Exam Committee and obtain the approval of the composition of this committee from the GRAD (Guarini School for Graduate and Advanced Studies), which has final authority over the membership requirements. The Thesis Exam Committee will consist of a minimum of three full-time Dartmouth faculty members of which a minimum of two must be from the MCB Program (including the Thesis Advisor) as well as an external member with a faculty-equivalent research appointment outside of Dartmouth. The external member may participate in meetings in person or via video conference. The Thesis Exam Committee will usually be the student's AC plus a fourth person who is usually a scientist that is not a member of the Dartmouth College faculty. If one member of the AC is not a MCB faculty member, they can serve on the Thesis Exam Committee only with the approval of the GRAD. It is imperative that the student inform the Guarini School of Graduate and Advanced Studies in sufficient time to allow for approval of the composition of the Thesis Exam Committee. The student must inform their program office of the composition of the Thesis Exam Committee and of the expected date of the defense.

Students must give each member of the Thesis Exam Committee a copy of the thesis at least two weeks before the date scheduled for the defense. Students planning to participate in the formal Geisel School of Medicine or Dartmouth College June graduation exercises should be aware that both the Guarini School of Graduate and Advanced Studies and the programs set deadlines regarding the submission, examination, and approval of theses. Typically, these deadlines occur during the month of May. It is each student's responsibility to work with their program office to ensure they meet these deadlines in order to participate in commencement. Students must contact their program office with date, time, and location of their thesis defense seminar for distribution of public seminar notices. If any member of the examination committee finds that the submitted thesis is inadequate, that member must immediately communicate their concerns to the Thesis Advisor and the other members of the examining committee, which may cancel the thesis defense as late as 48 hours before the scheduled time of the defense. Concerns from the outside examiner may be communicated up to 72 hours prior to the scheduled defense to allow the committee time to meet the 48-hour deadline.

Following a publicly announced and delivered seminar on the thesis material, the doctoral candidate will defend the dissertation before the Thesis Exam Committee. The Thesis Advisor is responsible for promptly notifying the MCB Office of the outcome of the defense. Should this committee find the thesis itself or the student's understanding of the thesis subject area insufficient for the conferral of the Ph.D. degree, the student shall be informed of the deficiencies and the areas that require modification. The thesis may be revised, and the thesis defense may be repeated once, and insofar as possible, the composition of the examining committee shall remain unchanged. The exam committee will determine an appropriate deadline for the revised thesis to be submitted. If a student fails to satisfy the concerns of the Thesis Exam Committee after a second attempt, the student will be immediately separated from the Program.

The student thesis can be approved provisionally, pending corrections and minor modifications recommended by the examining committee. Normally, the student's advisor will monitor these changes and upon satisfactory completion of them, permit the student to submit the finalized thesis to the Guarini School of Graduate and Advanced Studies. The final thesis must be received by the Guarini School of Graduate and Advanced Studies before a student will be awarded a Ph.D. degree.

F. Procedures in The Case of Potential Separation from the Program

In the event that a student faces potential separation from the Program due to course grades or other reasons or is denied advancement to candidacy due to failure at two attempts of the qualifying exam or other reason, an Assessment Committee will be convened to review the student's overall record and the pending separation prior to final action. The Assessment Committee will consist of the student's Thesis Advisor, the student's AC (if one has been formed), or the thesis exam committee (if a thesis has been submitted and the thesis and the thesis defense attempted), and the faculty and student members of the MCB Graduate Committee. If all these members cannot be assembled for a meeting in a timely manner (generally within about two weeks of being notified of the pending action) a majority of the members will constitute the Assessment Committee. The chair of the Graduate Committee will serve as Chair of the Assessment Committee, unless the Chair is the student's Thesis Advisor. In such case, the Vice-Chair of the Graduate Committee will serve as Chair. Students or faculty members who feel they might have a conflict of interest that would compromise their ability to make a fair and impartial decision, should absent themselves from the Assessment Committee and associated meetings. The Assessment Committee will function as a democratic committee with a single vote for each faculty member present and the final decision will be arrived at by closed ballot votes. The student members of the MCB Graduate Committee will not vote.

The Assessment Committee will review the overall performance of the student with respect to whether the student is qualified for a productive scientific, or related, career and as to their potential capacity for achieving Ph.D. level of scientific development within a reasonable timeframe. They will also consider any extenuating circumstances brought to their attention by the student, Advisor, or other informed party that may have contributed to the poor performance. Information about extenuating circumstances should be brought to the attention of the Assessment Committee by the student, Advisor or other informed party. In extraordinary instances, the Assessment Committee may recommend an alternative course of action to that which would normally be stipulated by the MCB rules and regulations for the particular circumstances that prompted the review process. Such a recommendation requires a 2/3 majority vote of the Assessment Committee.

G. MCB Student Grievance Policy

The committee-based process for guiding graduate student progress in MCB, while primarily designed to oversee scientific progress and direction, is also intended to guard against biased treatment of any individual. We have also established a grievance process consisting of multiple stages, to ensure that student grievances will be investigated fully and fairly, treated confidentially and decided in a timely manner. With an effective oversight/grievance committee structure, few grievances or disputes will reach the stage where they require formal resolution. However, when departmental and informal resolution is not feasible or successful, the graduate office is the next place to turn. A grievance may be handled as appropriate in the following stages:

1. When possible, speak directly to the person who bears responsibility for the complaint or who is the alleged cause of the complaint.
2. Speak to the Thesis Advisor and/or members of the Thesis Committee or AC.
3. Speak to the Chair of the MCB Graduate Program and/or the Chair of the department.
4. If a satisfactory resolution cannot be reached within the department or program, the aggrieved student may request a meeting with the Dean of Guarini School of Graduate and Advanced Studies to discuss the issue.

5. If the Dean, working together with the aggrieved student and appropriate faculty member(s), or representatives of the MCB Program is unable to reach a satisfactory resolution, the student can request in writing a formal hearing and ruling by the Deans and the Committee on Student Grievances. Formal hearings are conducted as described in the Guarini Student Handbook (see sections titled "Committee on Student Grievances" and "Formal Hearing" under Academic and Conduct Regulations).

Please note that allegations of scientific misconduct, violations of the academic honor principle, and certain issues of professional and personal conduct (sexual harassment, discrimination, and others described in the graduate handbook under code of conduct – non-academic regulations) must be reported to and handled by the Guarini Graduate Registrar.

III. TEACHING BY GRADUATE STUDENTS

An essential element of graduate education at Dartmouth is the experience gained in teaching. Therefore, at least one term of teaching is required of all MCB students.

Evidence of the successful completion of this requirement will be indicated by the student having received a passing grade in Biology 169 (Supervised Teaching in Biology) or equivalent. This teaching requirement is normally completed by serving as teaching assistant for one term during the second year in the program. The nature of the term system at Dartmouth means that this obligation will normally be fulfilled in the Summer, Fall, Winter, or Spring term of the second year, depending on the course assigned, but may be completed later with the approval of the GC. When assisting in a course, a graduate student will be expected to devote about 200 hours per term to this responsibility, which includes time spent in the teaching laboratory or discussion sessions, grading papers, attending lectures, lab preparatory sessions, etc. Faculty member(s) in charge of a course cannot require that teaching assistant(s) contribute more than 200 hours per term. One term of teaching fulfills one of the seven courses required for the Ph.D. Under no circumstances may students opt out of this requirement by having their advisors use research grant funds, for example, to pay a substitute.

At the end of the first year, the Graduate Committee will distribute to the first-year students a list of courses requiring a TA. Students will submit a ranked list of TA preferences. Teaching assignments will be made by the Graduate Committee in consultation with the faculty teaching the courses, taking into account student preferences. Subsequent responsibility for detailing TA teaching obligations (including such matters as examination and report grading, preparation of materials for the laboratory, lab and discussion responsibilities, etc.) rests with the professor(s) in charge of the course. Note that opportunities can arise from time to time for more senior students who would like greater teaching experience to participate in more than the minimum one term requirement. However, this requires that adequate teaching positions are available to accommodate the interested student(s) and that the advisor agrees, in which case final approval of the arrangement by the Graduate Committee is required.

Teaching assistants are expected to begin their duties no more than one week prior to the start of a course, and they are required to be available until the final grades are submitted, normally 1 week after the exam period (no vacations during this period). If, because of illness or some other legitimate reason, teaching assistants are unable to meet their teaching obligations, they should inform the appropriate faculty member so that adequate replacements can be found.

At the end of the teaching term, the professor in charge will:

1. Report a grade (HP, P, LP, or NC) for the course Biology 169 (Supervised Teaching in Biology) to the Biology Office for the student(s) who completed the TA(s)

2. Submit to the Biology Office a brief paragraph for placement in the student's folder, describing the student's teaching skills, especially noting any extraordinary ability (or any deficiency) that formed a basis for the grade. Such reports form a portion of the student's permanent record and could be quoted in subsequent letters of recommendation for faculty positions, etc. In instances of serious deficiency, the GC can require that the teaching experience be repeated but note that this will occur without the expenditure of additional program funds.

IV. ATTENDANCE AND VACATIONS

During any year in which they receive compensation from Dartmouth, regardless of the source of those funds, graduate students are committed by the terms of their agreement to be in residence for a period of twelve months commencing one week before Fall term registration. Vacation time should not exceed a total of one month per year and the time(s) should be mutually agreeable to the student and the Thesis Advisor. During the summer(s) students are expected to perform their thesis research and enroll in required courses as course availability and time permit. Students must obtain written permission from their Thesis Advisor and from the Chair of the Graduate Committee for any expected absences of greater than one month per year. In any case, students traveling abroad are encouraged to inform the MCB Office of their departure and return dates before leaving, and also if visa or travel difficulties arise during the trip.

Students who are primary caregivers for a child may qualify for Dartmouth's School of Graduate and Advanced Studies Child Accommodation Policy (CAP) immediately following the birth or adoption of a child, as outlined on the GRAD website (https://graduate.dartmouth.edu/policy/child-accommodation-policy). In planning an accommodation, students are encouraged to consult with their Thesis Advisor, the MCB Office, and the School of Graduate and Advanced Studies as soon as possible. If necessary to maintain full-time enrollment, MCB students shall enroll in UNSG299 for the term(s) during which their CAP-associated absence exceeds the allotted vacation time.

APPENDIX A

THE MASTERS PROGRAM

Normally, students are not accepted into the MCB Program if they indicate an initial interest in earning a master's degree at the time of their application to the program (i.e. we have no formal master's degree program). However, the MCB Program realizes that, once here, a student's career goals, expectations, and/or level of performance can change and therefore it might be in the student's best interest to leave the program and seek other alternatives. Accordingly, the program offers an opportunity to those students who have completed a body of acceptable work to write a thesis and thus leave the MCB Program with a Master's degree from Dartmouth College. The switch to the Masters track needs approval from the GC. Once approved, the requirements for the Master's degree are as outlined below. The judgment of whether or not the student has enough data to write an acceptable Master's thesis is made by the student's Advisory Committee in consultation with the respective Department and/or Graduate Program Chair.

a. Courses: Course requirements are the same as for the Ph.D., six courses total: three-term core course plus three MCB elective courses.
   Note: a course in research ethics, while useful, does not substitute for any of the six required courses.

b. Lab Rotations: three successfully completed lab rotations are required

c. Teaching: one term experience as a teaching assistant in the second year is required

d. Qualifying Exam: None Required

e. Research In Progress (RIP) presentation: Required
   Students in their second year and beyond are required to present a RIP seminar each year (defined as the period from July 1 to June 30) in which the student is enrolled for research credit (Bioc/Biol/Gene/Micr 197-199 or Bioc/Biol/Gene/Micr 297-299) in two or more terms. In the year in which the student expects to defend his/her thesis and receive the Masters, the student must still present a RIP seminar unless the confirmed defense date has been sent to the MCB Office before August 15.

f. Thesis: Required
   The Master's thesis should present a coherent investigation of an original scientific question. Both the topic and the experimental approach require approval by the Advisory Committee in consultation with the Department and/or Graduate Program Chair. Furthermore, the master's thesis will have the usual section components (introduction, materials and methods, results, discussion, literature cited, figures, figure legends, tables, etc.) and should conform to the standards of scholarship generally required for publication in a peer-reviewed academic journal. See Section II.E.

g. Oral Examination: Required
   The exam will be conducted by a committee of three Program faculty (or two program faculty plus one member from outside the Program, although an outside member on the committee is not required); the Thesis Exam Committee will usually be the same as the AC, although this is not a requirement. The composition of the Thesis Exam Committee and the date of the thesis exam must be approved by the Graduate Committee.

h. Oral Presentation: Optional, at the discretion of the Thesis Exam Committee

i. Submission of final thesis to the School of Graduate and Advanced Studies

APPENDIX B

M.D./PH.D. STUDENTS

Prior to choosing a lab after Geisel School of Medicine year two, M.D./Ph.D. students are not formally affiliated with any graduate program. During the first two years, M.D./Ph.D. students will complete two summer research rotations. M.D./Ph.D. students will choose a thesis lab after the second rotation. Any M.D./Ph.D. student that chooses an MCB lab will become members of the MCB Program. After completion of the second-year medical boards at the end of Geisel School of Medicine year two, M.D./Ph.D. students will enter the thesis lab and begin working full time on the Ph.D.

There are nine program requirements for M.D./Ph.D. students to fulfill for a Ph.D.:

1- two research rotations (completed before enrolling in the MCB Program)

2- two graduate course electives selected from the MCB approved course list

3- completion of an approved ethics course (does not count as an elective)

4- a qualifying exam

5- enrollment in journal club each term (Fall, Winter, Spring)

6- 6- annual Research In Progress (RIP) presentation

7- attendance at program functions (RIP seminars, and program seminars and symposia)

8- a thesis and a thesis seminar followed by a thesis defense

9- submission of final thesis to the Guarini School of Graduate and Advanced Studies