

# **GRADUATE PROGRAM IN CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY**

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Program Guide  
2021-2022

NOTE: Due to COVID-19 restrictions, some timelines, deadlines and requirements may be modified.



Graduate School of  
Biomedical Sciences

# TABLE OF CONTENTS

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|  |    |
|--|----|
| <a href="#">Welcome and Key Program Contacts</a> .....                                       | 3  |
| <a href="#">Curriculum Overview</a> .....  | 4  |
| <a href="#">Required Courses</a> .....   | 4  |
| <a href="#">Elective Courses</a> .....   | 4  |
| <a href="#">Remediation</a> .....  | 4  |
| <a href="#">Journal Club</a> .....   | 4  |
| <a href="#">Graduate Seminar</a> .....   | 4  |
| <a href="#">Research Forum</a> .....   | 5  |
| <a href="#">Teaching</a> .....   | 5  |
| <a href="#">Requirements for the Master of Science Degree</a> .....                          | 5  |
| <a href="#">Laboratory Rotations</a> .....   | 6  |
| <a href="#">Purpose</a> .....  | 6  |
| <a href="#">Rotation Matching Process</a> .....  | 6  |
| <a href="#">Qualifying Examination</a> .....   | 6  |
| <a href="#">Purpose</a> .....  | 6  |
| <a href="#">Timing of the Qualifying Exam</a> .....  | 6  |
| <a href="#">Selection of the Qualifying Exam Committee</a> .....                             | 6  |
| <a href="#">Overview of the Qualifying Exam Process</a> .....                                | 6  |
| <a href="#">Format of the Written Qualifying Exam</a> .....                                  | 7  |
| <a href="#">Evaluation of the Qualifying Exam</a> .....                                      | 8  |
| <a href="#">Admission to PhD Candidacy</a> .....   | 8  |
| <a href="#">Research, Career Planning, and Thesis</a> .....                                  | 9  |
| <a href="#">Selection of a Thesis Advisor</a> .....  | 9  |
| <a href="#">Selection of the Thesis Advisory Committee</a> .....                             | 9  |
| <a href="#">Career Planning</a> .....  | 9  |
| <a href="#">Thesis Advisory Committee Meetings and Assessment of Research Progress</a> ..... | 10 |
| <a href="#">Thesis Format and Defense</a> .....  | 10 |
| <a href="#">Publication</a> .....  | 11 |
| <a href="#">List of Program Students</a> .....   | 12 |
| <a href="#">List of Program Faculty</a> .....  | 13 |
| <a href="#">Boston and Medford Campus Faculty</a> .....                                      | 13 |
| <a href="#">Faculty Located at Maine Medical Center Research Institute (MMCRI)</a> .....     | 14 |
| <a href="#">Faculty Not Accepting Thesis or Rotation Students</a> .....                      | 15 |

The requirements described in these guidelines may be amended or altered by the Graduate Program. Note that GSBS-wide policies supersede program specific policies.

# WELCOME AND KEY PROGRAM CONTACTS

Welcome to the Graduate Program in Cell, Molecular and Developmental Biology (CMDDB). This Program Guide provides key information and guidelines on the requirements of the program. It supplements information contained in the GSBS Catalog (<https://gsbs.tufts.edu/studentLife/school-Catalogs>) which has the official degree requirements and course listings. It also supplements the GSBS Student Handbook (<https://gsbs.tufts.edu/studentLife/StudentHandbook>), which contains important information about topics such as the GSBS academic and registration policies, professional conduct guidelines, financial matters, and information about student benefits, services, and resources.

This Guide includes a listing of graduate students in the program and contact information for faculty, staff, and students. You can find information about the research interests and publications of the faculty, as well as up-to-date schedules of seminars, journal clubs and research reports on our website (<https://GSBS.tufts.edu/academics/CMDDB>). We would greatly appreciate any feedback from you to help us make this Guide more useful.

There are several people who can serve as valuable resources during your PhD training and are always willing to discuss any issues or concerns about the program, or direct you to the appropriate office. They are listed below, along with information on how to contact them.

The Program Director is elected by the graduate program faculty to oversee and administer the educational and research missions of the graduate program. The Program Director represents the interests of the program on the GSBS's Executive Council where policy matters concerning the School's programs are discussed and enacted.

The Program Director may also grant occasional well-justified exceptions to the Program Guide requirements on a case-by-case basis if the exceptions serve the educational interests of the student and the Program. However, course requirements must be satisfied (with possible substitute courses) and the qualifying exam must be passed and the thesis successfully defended.

The First Year Student Advisor serves as a mentor to the first-year students, including providing specific advice on selecting appropriate sites for laboratory rotations, choosing elective courses, and identifying laboratories for thesis work. In addition, senior students who are selected by the Program Director are also available to offer advice to younger students.

The thesis mentor helps students with thesis advisory committee selection, guides the student's research, and offers insights for career planning.

The Qualifying Exam Advisor guides the student through the Qualifying Exam process providing advice on topic se-

## KEY PROGRAM CONTACTS

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**Rachael Ryner**, Graduate Student Council Representative

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*All Boston phone numbers start with 617-636-.*

lection and approaches to constructing the written proposal and oral presentation.

The Admissions Director is responsible for recruiting high quality program candidates, identifying candidates for interview from the applicant pool, arranging for interviews of these candidates with program faculty, and selecting the best candidates (with input from the faculty) to be given placement offers.

The Seminar Director organizes both the outside seminars and the student seminar program.

The Program Coordinator assists the Program Director in the functioning of the program as needed, as well as helps students schedule rooms, complete forms, plan events, and manage program requirements.

The Curriculum Committee Chair oversees the quality of the courses and recommends curriculum changes as appropriate.

Graduate Student Council Representatives. Two representatives are elected by the students to serve as the program's representatives to the GSBS Graduate Student Council (GSC). The GSC organizes activities, including the Annual GSBS Relays, and the GSC Officers are ad hoc members of the GSBS Executive Council.

CMDDB Executive Committee provides guidance to the Program Director, faculty, and students in matters pertaining to programmatic and school requirements. The EC con-

## WELCOME AND KEY PROGRAM CONTACTS

sists of the Faculty directors mentioned above and other faculty Committee are appointed by the Program Director. The Program Director serves as the Executive Committee Chair.

## CURRICULUM OVERVIEW

### *Required Courses*

Students complete a series of required didactic courses designed to provide a strong knowledge base for their research. The GSBS Catalog for the year in which students were admitted lists these required courses (<https://gsbs.tufts.edu/studentLife/schoolCatalogs>). In addition, the Catalog contains course descriptions and progression plans for the first and second year.

### *Elective Courses*

Students are required to complete elective courses in addition to the required courses. Elective courses must be approved by the thesis advisor and the Program Director and should be used to explore students' interests and further their understanding of their thesis research fields. Students choose these courses from the list of electives in the GSBS Catalog. Courses may be chosen from any GSBS program or from other schools that allow cross-registration.

Elective coursework should be completed by the end of the fourth year. Additional courses may be taken at the recommendation of the mentor or the Faculty Advisor.

### *Remediation*

Remediation mechanisms are at the discretion of program Faculty and course directors and should be clearly stated in the course syllabus. Remediation is offered only to failing students and for them to only achieve the minimum passing grade.

### *Journal Club*

The overall goals of the Journal Club (JC) are to advance the student's skills in critically evaluating scientific literature and improve the student's presentation skills. Students may choose to present JC topics that they are familiar with, or they may wish to gain important experience by choosing topics that are new to them. Students should consult with the journal club course director about the journal club format and choosing a topic for presentation. Students should enroll in the journal club consistent with their specialization course. First year students have their own journal club. Students doing a neuroscience related thesis may enroll in the Neuroscience journal club with permission of the program director.

Attendance in JC is required and students who do not attend regularly will receive a warning; continued absence will result in a failing grade. PhD students must register each semester for 4 years and MD/PhD students for 3 years.

### *Graduate Seminar*

The goal of attending the Graduate Seminars is to improve the student's appreciation for how research progress is obtained and to raise awareness of recent advances in the field. All students must register each semester for graduate

# CURRICULUM OVERVIEW

seminar except for those students who have registered for PhD Degree Only. The seminar schedule is available online. Attendance is mandatory unless excused by the program director or Seminar director.

## *Research Forum*

Students must present an annual report of their research, except those students who have received permission to defend their theses. The Student Research Forum schedule is provided to students at the beginning of each academic year and will also be posted on the GSBS calendar. Research Presentations are attended by students, faculty, and other interested members of the Program. All students are required to attend these meetings. First year students present a 10-minute podium presentation on a rotation project of their choosing, which takes place at the end-of-year annual program meeting in May or June.

## *Evaluation of Student Progress*

Evaluation of satisfactory progress in the Program will be based on course grades and thesis committees. Students should be familiar with the GSBS Academic Standing Policy, which is included in the Student Handbook (<https://gsbs.tufts.edu/studentLife/StudentHandbook>).

## *Teaching*

A student has the option (with the approval of the Program Director and the Thesis Advisor) to participate in mentored teaching of a one semester professional course, to give mentored lectures in graduate courses, or other courses as available. All course assignments are determined by a consensus of the student, his/ her advisor, the course director, and the Program Director. To promote the acqui-

sition of communication skills, the student is expected to be actively involved in laboratories, tutorials, and teaching meetings, and to prepare and deliver introductions to laboratories and/or formal lectures.

The course director will provide written and/or oral evaluations of the teaching performance for each graduate student. (Note: Teaching evaluations are provided solely for the purpose of improving the student's teaching skills through feedback and are not graded.)

## *Requirements for the Master of Science Degree*

A student in good standing in the CMDB doctoral program who is unable to complete the requirements for the PhD degree may be allowed to write and defend a master's thesis. Permission to submit a Master's thesis must be obtained in advance from the Program faculty and will only be granted if compelling reasons for leaving the PhD program are provided, if specific guidelines are followed and specific criteria are met. Master's Degree Requirements can be found in the GSBS Student Handbook (<https://gsbs.tufts.edu/studentLife/StudentHandbook>). A Master's candidate may only begin writing the thesis after obtaining explicit permission to do so from the thesis advisory committee. The student's thesis must describe original research carried out by the candidate under the supervision of a faculty member, and must form a coherent body of work of publishable quality, even though the scope of the work may not permit publication. The Master's thesis should be presented in the same format as a PhD thesis, as required by the GSBS. The suitability of the Master's thesis will be determined by the thesis advisory committee after an oral defense of the thesis by the candidate and is subject to ratification by the faculty of the GSBS.

# LABORATORY ROTATIONS

## *Purpose*

Laboratory rotations are designed to acquaint students with some of the research projects of current interest in the program, to allow students to assess the suitability of a particular lab for their thesis research, and to allow faculty members to assess the suitability of individual students for work in their labs. A minimum of four lab rotations must be completed during the first academic year.

## *Rotation Matching Process*

Students choose rotations based on their interests and the willingness of the rotation mentor to accept a student. Students are strongly encouraged to choose rotations that expose them to areas of research with which they are not already familiar.

The GSBS Laboratory Rotation Policy is published in the Student Handbook (<https://gsbs.tufts.edu/studentLife/StudentHandbook>) and the dates for laboratory rotations are posted on the GSBS website in the Academic Calendar (<https://gsbs.tufts.edu/student-life/academic-calendar>).

Several weeks before rotations begin the GSBS Dean's Office emails students a list of available faculty laboratories. This email contains a link to a survey in which students are to enter their first, second, and third choices for rotations. The First Year Student Advisor meets with students to discuss their possible matches. Information regarding the research areas of program faculty members can be found at the GSBS website (<https://gsbs.tufts.edu/facultyResearch/faculty>). In addition, students should meet with potential mentors during the last three weeks of the immediately prior rotation, but no commitment can be made

about whether or not the student may rotate in a lab before all rotation matches are announced. Students should share their interests and mentors discuss the possible projects available in the lab. All students will be notified of their matches simultaneously by the Student Advisor.

Each rotation is evaluated by the rotation mentor. Grades are given for each rotation. When multiple rotations are completed in one semester, the grades are averaged to obtain the grade for the Laboratory Rotations course.

# QUALIFYING EXAMINATION

## *Purpose*

A Qualifying Examination is given to all doctoral candidates. The purpose of the examination is to determine whether a student: 1) has adequate general knowledge in research, 2) is able to formulate experiments and test biological hypotheses, 3) can critically analyze experimental results, 4) has the ability to communicate both orally and in writing; and 5) has creativity.

## *Timing of the Qualifying Exam*

The Qualifying Examination must be completed by the end of summer of the First Year. MD/PhD students must complete the exam by the end of Spring Semester of the 1st Year of PhD training. All required first year courses must be passed prior to the exam, unless specific permission to waive this requirement is given by the Program

Director. Under no circumstances will a student be admitted to PhD candidacy until he/she has passed the required first year courses and the Qualifying Exam unless such courses are not offered in the student's first year. It is expected that the written proposal will be completed within 4 weeks from the time the student has submitted their Specific Aims to the Qualifying Exam Advisor. The class entering January 2021 due to the COVID-19 pandemic should take the exam in the summer or Fall of 2021 unless granted permission by the Program Director.

## *Selection of the Qualifying Exam Committee*

The Qualifying Examination (QE) Committee will be comprised of three GSBS faculty members; the student's mentor cannot serve on the committee but can be present for the oral exam. Committee members will be chosen by Qualifying Exam Advisor, who will designate one of them as the Chair. The Chair must be a CMDB member.

Any questions that may arise during the examination process must be directed to the QE Committee Chair only or to QE Advisor in the event that the exam committee Chair is not available. If neither is available, the student may direct the question to the Program Director.

## *Overview of the Qualifying Exam Process*

For the Qualifying Examination, students are required to write and orally defend an original research proposal. The subject of the research proposal can be the student's thesis topic. However, at least one of the Aims of the proposal should be different than a grant written by the mentor. Whether the Aim is novel will be determined by the QE Advisor.

In preparing for the Qualifying Exam, a student should feel free to ask the general advice of other students and faculty members; however, the written work should be created and prepared by the student without any outside assistance. In particular, the written document should be written and edited solely by the examinee, without assistance in content, style, grammar, or syntax, and should not be copied from the mentor's grant or any other source. The mentor should

# QUALIFYING EXAMINATION

not read or edit the student's proposal prior to submission. Discussion with the mentor of experiments in the proposal during the writing process should be limited to experiments the student is contemporaneously conducting in the laboratory. Arranging practice oral defenses is permitted, although faculty may not be present at these mock oral exams.

## Summary of the Qualifying Exam Process:

1. Student turns in a one-page summary of the proposal to the Qualifying Exam (QE) Advisor by the stated deadline above. This summary should consist of a brief introduction, significance of the proposed work and specific aims to be addressed. The QE Advisor may suggest revisions.
2. The Qualifying Exam Advisor chooses the QE Committee, which consists of three GSBS program faculty; with one CMDDB faculty member designated to serve as Chair of the committee.
3. The QE Chair coordinates efforts of the QE Committee and the student to shape the scope of the Aims. Very few students have had any significant experience writing proposals in general and Specific Aims in particular. Thus, it is very common for students to propose Aims that are overly broad in scope and would require a team of investigators 4-5 years to finish rather than the recommended scope of what an efficient graduate student could accomplish by him/herself in 2-3 years. Often, the initial Specific Aims page is poorly structured. This is to be expected of students at this stage of graduate school. The QE advisor will approve the specific aims page. These aims will be forwarded the QE Committee who may ask for changes and if so, will work with the student to help him/her to further revise the Specific Aims page. Note that it is not the QE Committee's job to ensure that the experimental approaches are valid or appropriate at this point; their focus is on the scope of the proposal
4. After the QE Committee approves the Specific Aims, the student has approximately 4 weeks to write the full proposal; the precise deadline is set by the QE Chair in consultation with the student.
5. The oral defense should occur approximately 1 week after the student turns in the full written proposal. The student should schedule the date and time for the oral defense when their topic is approved. The student's thesis mentor can attend the oral defense, but should not ask questions of the student (or answer them). A QE member or the mentor can participate in the oral exam in person or via video link.

## *Format of the Written Qualifying Exam*

The Qualifying Exam paper consists of a hypothesis-driven research proposal in the style of an NIH pre-doctoral (F31) fellowship application.

The proposal shall not exceed 6 single-spaced, printed pages, using 0.5 inch margins all around and 11 point Arial or Helvetica font. This page limit includes any diagrams,

figures, tables, or other data that you wish to use (note: it is highly recommended to include some figures to illustrate your hypothesis, approach or findings). The proposal should have a concise title, and should contain the following sections:

1. Abstract (1 page maximum - Not counted in the 6 page limit).
2. Specific Aims (1 page maximum - Not counted in the 6 page limit). State the broad, long-term objectives, the hypotheses to be tested, and describe concisely what the proposed research is intended to accomplish. Provide the general methodologic approaches to be used in each aim. The most effective way to state the specific experimental aims is to make a list. For a research proposal of this type, 2-3 highly focused specific aims should suffice. More than 3 specific aims are strongly discouraged.
3. Research Strategy (6 pages Total)
4. Background and Significance (1-2 pages). Provide the background to your proposal, critically evaluating (not simply reporting) existing knowledge, and specifically identify the gaps which your proposal is intended to fill. The first paragraph of this section should put your project in its broader biological context, but you should quickly focus on the specific area to be addressed by your proposal. Clearly state the importance of the proposed research. Relevant preliminary data that supports your general hypothesis or supports the general feasibility of your overall proposal may be included. To ensure a critical evaluation of the literature, there is a strict limit of 40 references in this section.
5. Approach (4-5 pages). Briefly restate the hypotheses to be tested, and outline the experimental design and the general procedures to be used to accomplish the specific aims of the project. You need not provide lots of technical details (e.g., buffer compositions, pH, etc.). In general, it is helpful to organize this section around the specific aims you listed. For each set of experiments, you should discuss:
  - the rationale for the approach you have chosen,
  - controls -- both positive and negative,
  - expected or possible results and their interpretation,
  - alternative approaches which might be useful, especially if your intended experiments fail, and
  - potential difficulties and limitations (i.e., the feasibility) of the approach.
6. Preliminary data may also be included in this section, especially if there are experiments that support your hypotheses. However, most students will not have preliminary data to include and are not expected to have any. Note that this section does not have a reference limit because we assume that these references will cite techniques.

# QUALIFYING EXAMINATION

7. References (Not counted in the 6 page limit). Citations should be listed by number in the order cited in the text of the proposal. Please provide the full citation, including title and up to 10 authors.

Students should use a reference manager like Endnote or Sciwheel to insert and manage their references. The style of the journal *Current Biology* is recommended.

## *Evaluation of the Qualifying Exam*

The oral component of the Qualifying Exam will be approximately 90 minutes in length and will be administered approximately one week after submission of the written portion. The student should prepare a short presentation that provides an overview of the rationale, Aims and methods of the proposed research. At the end of the oral exam, the final assessment of exam performance will be made by the Qualifying Examination Committee in private session. The exam will be graded Pass, Fail or Provisional Pass, and a report that includes this grade plus a summary of the student's performance (emphasizing areas of weakness that should be addressed in the future by the student's mentor) will be submitted to the Program Director.

- In the case of a *Pass*, no further work is required on the QE.
- A *Provisional Pass* is intended to communicate to the student that while important aspects of the QE were satisfactory, one or more important aspects of the QE were unsatisfactory. It is also intended to convey that the examining committee observed sufficient strength in the examination to have confidence that the student can and will successfully fulfill the conditions imposed by the committee. In all cases in which a Provisional Pass grade is given, the exam committee should

specify in writing to the student the time frame in which the conditions must be satisfied. This typically involves a revision of the written proposal, but could include a second oral exam as well. In some cases, the QE may specify that specific coursework be taken to fill gaps in knowledge. The Provisional Pass is a common outcome of the exam.

- If the requirements for a *Provisional Pass* are not fulfilled within the time frame specified, the CMDDB Executive Committee, in consultation with the Qualifying Exam Committee and PhD Advisor, will decide on whether or not a second qualifying examination is allowed. If it is not allowed, the *Provisional Pass* grade will convert to a grade of Fail.

Failure to pass the Qualifying Exam will result in dismissal from the School.

## *Admission to PhD Candidacy*

The final decision with respect to PhD candidacy is generally straightforward, and will usually be made by the Program Director. In unusual situations, the Program Director may ask the Program Advisory Committee to vote on candidacy. A student will be admitted to PhD candidacy upon satisfying the following criteria:

1. Successful completion of the first year required didactic courses. In the case of the class the started in January 2021, this requirement will be waived. However, students must pass the first year courses when offered.
2. Successful completion of the Qualifying Exam. In the case of a student receiving a Provisional Pass, this would include certification by the QE Committee Chair that all conditions have been satisfactorily fulfilled.



# RESEARCH, CAREER PLANNING, AND THESIS

Please note that all CMDDB students are encouraged to apply for a pre-doctoral fellowship as part of their training. If the NIH does not offer an F31 option for the grants of the student's thesis mentor, there are sometimes private foundations that can be applied to. Students should consult with their mentor and with their Thesis Advisory Committee for advice in this regard.

## *Selection of a Thesis Advisor*

Students are matched with thesis mentors in May of their first year after completing their laboratory rotations. The centralized matching system is designed to maximize the chances that students are matched with one of their top choices. Starting in mid-April, students should begin to discuss with potential thesis advisors the range of research projects that may be open to a student. No such discussions should occur at any earlier time. At no time should a student expect, or faculty members provide, any guidance or commitment as to the likelihood that the student would be accepted into the lab. At this stage, all students are afforded an equal opportunity to discuss potential projects with all faculty members who have indicated a willingness to accept one or more students.

During a predetermined period in May, each student will submit a list of his/her first, second and third choices of thesis labs. The first year advisor will make known to relevant faculty members the names of students who have listed the faculty member as a first choice. Each faculty member will then have the option to accept the student(s) or to decline. When more than one student asks to be accepted into the same lab and only one space is available, the faculty member has the option of choosing which student to accept. If a student is not accepted into his/her first lab choice, every effort will be made to assure that that student's second choice is successful. In summary, faculty members may not make commitments to particular students and students should not make commitments to faculty members or ask for commitments from faculty members except through the process described above.

MD/PhD students usually select a thesis advisor after completing two summer rotations during medical school and upon entering the program.

A student who chooses a faculty thesis mentor in a research lab that is not part of the CMDDB Program must decide whether to switch graduate programs (subject to the approval of the other program) or stay within the CMDDB Program. In the latter case, the student would be required to meet all the requirements of the Program, the thesis advisor would have to be approved by the CMDDB Program Faculty, and the student's thesis project would have to be judged appropriate for a degree in CMDDB.

## *Selection of the Thesis Advisory Committee*

PhD students select their Thesis Advisory Committee early in the fall semester of their second graduate year and hold their first TAC meeting before the end of the semester. MD/

PhD students will select a TAC and hold their first meeting during fall of their first graduate year. Students should consult with their thesis mentor regarding the composition of the TAC.

The TAC consists of at least three members from GSBS including two from the CMDDB Program (one of which can be the student's research advisor). Other GSBS faculty members can be added as appropriate. A committee member from outside Tufts University will take part in the student's final oral defense of the thesis; this examiner can be added to the committee at any point and often takes part in at least one committee meeting prior to the student's thesis defense. The external member must hold a faculty rank, or its equivalent, if s/he is not at an academic institution. The thesis advisory committee members decide whether the outside examiner proposed by the student is suitable. This decision should be made unanimously, and the committee needs to consider potential conflicts of interest. The TAC chair must be a CMDDB Program faculty member other than the thesis advisor.

The purpose of the TAC is to provide research guidance, and act as consultants to the student with regard to his/her research project, and help resolve any issues that the student may have with their thesis mentor. The TAC also evaluates whether or not adequate progress is being made towards completing the PhD. The student is responsible for scheduling meetings and submitting progress reports. The student and his/her advisor may seek guidance from the Program Director on selection of TAC members. The composition of the Committee may change over the course of the thesis to receive the best possible advice. This should be done in consultation with the TAC.

## *Career Planning*

All PhD research trainees must have an Individual Development Plan (IDP) to help them develop their career paths. Tufts has created two forms to assist students in identifying their career goals and the current activities they participate in to achieve them. These forms are available at <https://gsbs.tufts.edu/studentLife/currentStudents/forms>.

- The IDP form is intended help students consider their career aspirations as well as the types of skills and attributes that may affect these aspirations and students' ability to attain their goals. It is not intended to predict or identify careers that match their skills. The document is for students' personal use only. Students are not required to share this document with anyone or provide anyone at Tufts with a copy of the completed document. Students may, however, choose to share the document with mentors who may suggest ways to improve skills that are appropriate to the career path(s) being considered. This document should be a living document and one that is updated as students advance in their training.
- The Training and Career Goals Progress Report form is designed to help students think about what they are learning and how to develop professionally. Stu-

# RESEARCH, CAREER PLANNING, AND THESIS

dents are asked to complete this form with a reflective assessment of their current progress and the plans for reaching both short- and long-term career goals. Note that some questions on the form may not apply depending on a student's stage of training. This annual progress report is designed to provide ongoing documentation of progress made towards career goals. Once a year, students complete this form and submit it to their thesis committee along with their research reports for discussion at a TAC meeting. It is the responsibility of thesis committee to provide advice on the resources that will help students achieve their goals at Tufts and beyond.

IDPs have proven so valuable that NIH has mandated that every trainee that it supports have one. Students can learn about IDPs at this very valuable site, <http://myidp.sciencecareers.org/>. They may also talk with their mentors, Student Advisors, the Program Directors, or the Associate Dean about career planning, in addition to their Thesis Advisory Committee.

## *Thesis Advisory Committee Meetings and Assessment of Research Progress*

CMDB PhD students are responsible for holding their first Thesis Advisory Committee (TAC) meeting before the end of the fall semester of their second graduate year. CMDB MD/PhD students must hold their first TAC meeting in the fall semester of their first graduate year.

In most circumstances, two meetings a year, one in the fall semester and one in the spring semester, will be adequate to evaluate the student's progress in the graduate research course. If the TAC deems it necessary, however, they may require interim meetings to ensure that the student receives proper guidance and support.

At each TAC meeting, the committee, PI and student should discuss and decide on expectations to be met prior the next meeting and set a date for that meeting. Interim committee meetings for any reason other than granting permission to defend may not be scheduled any sooner than two months since the last meeting. The TAC can choose not to provide a grade at an interim meeting as long as a regular meeting is held within the term's timeframe. However, at the discretion of the TAC, a grade may be assigned at an interim meeting. Only one grade will be permitted each term. Failure to hold meetings in a timely fashion will result in an Incomplete grade for research for the semester which will become a failing grade if not completed by the end of the subsequent term.

Students should summarize their research progress and plans on the most up to date TAC Evaluation form on the GSBS website (<https://gsbs.tufts.edu/studentLife/current-Students/forms>). After the Committee meeting, the TAC Chair enters the Committee's assessment on the Thesis Advisory Committee Evaluation form and assigns a grade for Graduate Research. The form is signed by all members and an electronic copy is sent to the GSBS Registrar and Program Director who records the grade on the student's

transcript.

At each meeting, the TAC evaluates the student's progress towards the PhD and specifically notes whether or not the TAC feels the student "meets", or "does not meet" expectations. Students should be aware that by far the most common evaluation will be "meets expectations". "Does not meet expectations" is meant to be a clear signal to the student that their work rate or quality (or both) is below the standards expected of PhD students. In these cases, which we hope and expect will be quite uncommon, the student will be provided with a clear set of goals and criteria for meeting expectations. Starting with a student's 4th year, the TAC will need to indicate on each Report whether or not the student is making "reasonable progress" towards completing their thesis project. The purpose of the TAC Evaluation form is to ensure that both students and their TAC are on the same page, that students have a clear idea of the quality and quantity of their efforts, and that issues that could delay a student's progress or lead to a student leaving the Program before completing the PhD requirements are dealt with sooner rather than later.

**CMDB Progress Reports.** Students are required to prepare a short written progress report for each TAC meeting. The progress report should start by outlining the goals set at the prior TAC meeting. The student should then note his/ her progress on each of the goals, providing key data and results in the report. New directions, if any, should be discussed, followed by a brief outline of experimental plans and research goals for the next 6 months. The progress report must be sent to the TAC at least 1 week prior to the meeting. Failure to do so inevitably reduces the value of the meetings.

**Permission to Set a Defense Date.** The TAC will grant a student permission to defend when the experimental results are sufficient for the thesis research to be concluded, or that at most a small number of non-critical experiments remain. It signals that the student can and should schedule his/her thesis defense within the next 3 months.

## *Thesis Format and Defense*

When a student receives permission to defend, he/she should make an appointment to meet with the Associate Dean. Students will receive instructions on all aspects of the process used to complete the degree, thesis formatting guidelines and information about Commencement Ceremonies at Tufts University.

To complete their graduate studies, students must write a thesis and defend their research in an oral examination. Students distribute their thesis to their Thesis Defense Committee members approximately two weeks before their scheduled defense. The chair of the thesis committee will contact all committee members, including the outside examiner, 48-72 hours prior to the defense to determine if the thesis is generally acceptable to the committee.

The oral thesis defense is the culmination of the thesis process and consists of both a public presentation of ap-

# RESEARCH, CAREER PLANNING, AND THESIS

proximately 45-60 minutes, followed by a closed discussion period with the committee and outside examiner. The public presentation is the opportunity for the student's lab and the GSBS community at large to hear the research. Consequently, the ideal format is for in-person public presentations is as follows:

- In Boston for students in Boston or Medford labs
- In Portland for students in Maine Medical Center Research Institute Labs
- In Bar Harbor for students in Jackson Labs

However, a fully remote (via Zoom) public presentation is acceptable.

For those students who may be working at affiliated (non-Tufts/MMCRI/JAX) labs, the defense should take place at the location the student was originally placed. In-person public presentations should also be available via videoconferencing for faculty and students on different campuses.

It is preferable that all members of the Thesis Advisory Committee (TAC) plus the approved outside examiner

be physically present at both the public presentation and closed discussion. However, if necessary and unavoidable, one or more committee members may be remote for the presentation and discussion. During the deliberations of the thesis examination committee, the committee should determine what revisions need to be made to the thesis document and the amount of time needed to complete those particular revisions. The GSBS Time from Thesis Defense to Completion Policies, governing thesis revisions and continued receipt of a stipend, is in the GSBS Handbook (<https://gsbs.tufts.edu/studentLife/StudentHandbook>).

## *Publication*

There is no formal requirement for publications before a student is allowed to apply for graduation. However, in the absence of a published (or accepted) paper in a peer-reviewed journal on which the student is a first author or co-first author, the TAC must make a considered judgment that the body of work done by the student is significant and will likely result in a peer-reviewed first author or co-first author publication.

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