

GRADUATE PROGRAM IN GENETICS

Program Guide

2020-2021

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



Graduate School of
Biomedical Sciences

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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 Genetics. 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, and 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 other 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/genetics>). 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 administer the educational mission 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 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.

The Qualifying Exam Advisor guides the student through the Qualifying Exam process providing advice on topic selection and approaches to constructing the written proposal and oral presentation.

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.

JAX Director of Predoctoral & Postdoctoral Education oversees and coordinates all Tufts at JAX programs and liaises with GSBS program directors and Dean regarding programmatic directions.

KEY PROGRAM CONTACTS

Pamela C. Yelick, Program Director

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Henry Wortis, Student Advisor & Qualifying Exam Advisor, Boston Campus

Jaharis 807	617-636-6718	henry.wortis@tufts.edu
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Gareth Howell, Student Advisor & Qualifying Exam Advisor, JAX Campus

NRB2095	207-288-6572	gareth.howell@jax.org
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Meredith Theeman, JAX Director of Predoctoral & Postdoctoral Education

JAX GE	207-288-1559	meredith.theeman@jax.org
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Diana Pierce, Program Coordinator

Stearns 514	617-636-6836	diana.pierce@tufts.edu
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Phil Hinds, Director of Admissions

Jaharis 607	617-636-0306	philip.hinds@tufts.edu
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Rebecca Brown, Graduate Student Council Representative

Jaharis 429	617-627-5682	rebecca.brown@tufts.edu
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Salwa Mostafa, Graduate Student Council Representative

Jaharis 401	617-636-3645	salwa.mostafa@tufts.edu
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Aidan Burn, Journal Club Leader (Boston)

Jaharis 401	617-636-6526	aidan.burn@tufts.edu
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Sarah Heuer, Journal Club Leader (JAX)

JAX	207-288-6428	sarah.heuer@jax.org
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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.

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 Relays, and the GSC Officers are ad hoc members of the GSBS Executive Council.

Journal Club Leaders. A journal club leader – one from Boston and one from JAX – will help facilitate scheduling the Genetics Journal Club presentations, assigning Faculty advisors to attend, and take student attendance.

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

CURRICULUM OVERVIEW

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 years.

For MD/PhD course requirements, please see the Course Catalog.

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.

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 expand their knowledge by choosing topics that are new to them. Students should consult with their mentors when choosing a topic for presentation.

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 seminar except for those students who have registered for PhD Degree Only.

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 of B- or S as applicable.

Research Presentations

Students must present an annual report of their research, except those students who have received permission to defend their theses. The Student Research Presentation 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.

Requirements for the Master of Science Degree

A student in good standing in the 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 and if specific guidelines are followed and specific criteria are met. Master's Degree Requirements can be found in the GSBS 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.

Requirements for the MD/PhD Degree

All MD/PhD students are required to participate in Genetics Program Journal Club, Seminar, Research Presentations as per the PhD students.

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 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/studentLife>).

Several weeks before rotations begin the GSBS Dean's Office will email 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 Program Student Advisors meet 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 should discuss the projects available in the lab. All students will be notified of their matches simultaneously by their Student Advisors.

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. If only one rotation is completed in a semester, the grade for that rotation is reported as the grade for the course.

Due to restrictions from the COVID-19 pandemic, first-year students enrolled in the Mammalian Genetics Program at the Jackson Laboratory (JAX) in Bar Harbor, ME will complete all of their laboratory rotations at JAX. The GENE-JAX Program Adviser works with students and faculty to confirm rotation matches and finalize placements in thesis labs.

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.

The Qualifying Exam Process

For the Qualifying Examination, students are required to write and defend orally an original research proposal. The subject of the research proposal should not be the student's thesis topic, but it may be closely related – “topic related” - not currently under investigation in the thesis lab or the focus of previous work experience.

Students are encouraged to discuss the scientific merits of their proposals with the faculty or anyone else in the scientific community. They should also feel free to ask for help in finding specific information, (e.g. if a student is considering using *C. elegans* as a model in a proposal, he or she would likely want to consult an expert in the field regarding the nuances of that system). Students should not ask faculty to actually suggest a proposal or to play any kind of active role in the development of their proposals. All too often, students who fail to talk sufficiently with faculty members have a difficult time with the exam.

The Qualifying Examinations must be completed by the end of the second year for PhD students. MD/PhD students may take the exam earlier. By mid-late May of their second year, students meet with the Boston or JAX Qualifying Exam Advisor, as appropriate, to review the guidelines for the qualifying examination and address questions concerning the mechanics of the examination. Students will then meet individually with the appropriate Qualifying Exam Advisor to discuss topic area for their qualifying exam. This will allow the Qualifying Exam Advisor to select appropriate members for the Qualifying Exam Committee.

The Qualifying Exam Committee (QEC) for each student will consist of three members of the Genetics Faculty, or two Genetics Faculty plus an additional Tufts GSBS faculty member, all of whom are experts in the field of the thesis topic. The Qualifying Exam Advisor (in consultation with the Program Director and the Student Advisor if necessary) will select the QEC members, including the committee chair. The chair of the QEC will be selected based on the topic chosen for the exam. The second committee member will be selected from the program faculty with whom the student rotated (excluding the thesis advisor). The third member will be selected from the Tufts GSBS faculty as a whole.

The student will then work with the QEC chair and the appropriate Qualifying Exam Advisor to establish a timeline for the qualifying exam. Qualifying Exams are taken in July of their second year preferably, or by August if needed.

Qualifying Exam Topic Proposal

Students should submit a one-page summary of the proposal to the members of their Qualifying Exam Committee and/or the appropriate Qualifying Exam Advisor. The proposal should consist of an overview, specific aims, and brief paragraph describing the significance of the proposal. Students may have any willing member of the faculty comment on their proposals but be warned that faculty can only give a personal opinion that may not coincide with the views of the exam committee. When a student's proposal is found to be acceptable by the Qualifying Exam Committee and/or the appropriate Qualifying Exam Advisor, it will be used to form the basis for the full-length proposal.

Extended QE Summary

Students are allowed to submit a 3-5 page extended proposal to their QEC for feedback. The extended proposal should consist of an expanded Specific Aims and an outline for the Experimental Approach. The extended proposal must be submitted to the QEC at least 2 weeks before the proposal deadline, to allow sufficient time for faculty review and input.

If rewriting is necessary, the revised proposal must be submitted within 2 weeks after such notification by the QEC. Students should be warned that the QEC will only be able to make general statements about the credibility of the proposal at this time.

After the Topic Proposal is approved, students will have 4 weeks to complete the Written Proposal. Students should schedule their Oral Exams for one week after submitting the Written Proposal to the QEC.

Written Qualifying Proposal

Approximately 4 weeks after obtaining topic approval by the QEC, and on the date established by the QEC, students must submit the written document to each QEC member, following the prescribed format described below.

The QEC will read the proposal and decide no later than 48 hours in advance of the established Qualifying Oral Exam date whether the oral exam will take place or whether the proposal should be rewritten, according to the recommendations of the QEC, before an oral exam is permitted.

If rewriting is necessary, the revised proposal must be submitted within two weeks after such notification by the QEC. The final proposal must be submitted exactly one week prior to the oral defense.

Format of the Written Qualifying Exam

The format of the written proposal is based on an NIH grant application and should be as follows (typed, double spaced, page numbers, half inch margins and 11 point Arial, Helvetica or Times New Roman):

1. Title page
2. Project Summary/Abstract - 1 page

QUALIFYING EXAMINATION

3. Specific Aims - 1 page
4. Background and Significance - no more than 3 pages
5. Experimental Design - no more than 6-10 pages
This should not involve an overly detailed description of technical details but should emphasize the order of experimentation with potential pitfalls and alternative approaches, as well as an interpretation of the potential results. Methods should only be described in sufficient detail to provide convincing evidence that you appreciate the demands and difficulties of the proposed techniques. Do not exceed the page limits. All figures should fit within the page limits.
6. Bibliography

Evaluation of the Qualifying Exam

At the beginning of the Oral Defense, the student will be asked to leave the room for 5 to 10 minutes so that the attending faculty can discuss the order of questioning. The student will then be asked to give no longer than a 10-minute summary of the highlights of the proposal. There is no limit to the range of the topics to be included in the discussion. However, the student is not expected to know everything; rather be willing to give an opinion. "I don't know" is a valid answer. The format will be that of an informal scientific discussion. Faculty members are expressly requested not to attempt to "grill" or aggressively question students.

At the end of the exam the student will be requested to leave the room and wait outside during the discussion of the proposal. The student will be informed of the grade immediately upon the conclusion of this discussion.

The written and oral parts of the exam will be graded separately. Possible grades are Pass, Incomplete, and Fail.

- Pass: No additional work is required.
- Incomplete: Some aspect of the work is not satisfactory and needs to be redone or completed before passing.
- Fail: A failing grade carries with it a recommendation to the Program Director that the student not continue in the program.

If the written portion of the examination is in any way unsatisfactory, but the oral examination is acceptable, the student may be asked to rewrite portions, or all, of the proposal. The student will then have 2 weeks to complete the rewriting.

If the oral portion of the examination is unsatisfactory, this portion must be repeated within 2 weeks of the original oral examination or within one week of submission of a revised written proposal, if required by the QEC.

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

The final decision dismissal from the program will be made by Program Director in consultation with QEC and Faculty following a review of the student's complete first and

second year record. If the student is not dismissed at that time, the faculty will decide an appropriate course of action consistent with the program's requirement that a student pass the QE before beginning full time thesis research. The final decision about passing on to the third year will be made at that faculty meeting.

Admission to PhD Candidacy

The student must pass the qualifying exam to be considered for PhD candidacy. Failure to pass the Qualifying Exam will result in dismissal from the School. In addition, the student's performances in courses and in the laboratory, as well as any other information that can be used to predict whether or not the student will be able to produce high quality thesis research is considered. The final decision regarding admission to PhD candidacy or dismissal from the program will be made by Program Director in consultation with QEC and Faculty.

RESEARCH, CAREER PLANNING, AND THESIS

Selection of a Thesis Advisor (Boston Campus)

Students are matched with thesis mentors 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 student 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 do not recruit students into their labs 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 Genetics Program must decide whether to switch graduate programs or stay within the 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 Genetics Program Faculty, and the student's thesis project would have to be judged appropriate for a degree in Genetics.

Selection of a Thesis Advisor (JAX Campus)

Students will work with the JAX Student Advisor throughout their first-year to identify potential thesis advisors. Final decisions regarding thesis advisors will be made in May of their first year.

Selection of a Thesis Advisory Committee

PhD students select their Thesis Advisory Committee (TAC) early in the fall semester of their second graduate year, and MD/PhD students do so during their first graduate year. **Students are responsible for holding their first TAC meeting by the end of the Fall Semester 2nd Year**, preferably no later than December 1.

The Thesis Advisory Committee will consist of three members of the Genetics Faculty (in addition to the mentor). **For students on the JAX campus, at least one member of their thesis committee must be from the Boston campus.** The TAC may also include faculty who do not belong to the Genetics Program if their expertise would be helpful in guiding the student's research. The expertise needed for the thesis project and the probability of forming good working relationships should be considered as the members of the committee are selected. The thesis advisor provides input on the committee makeup as he/she is most likely to know what expertise is necessary on the TAC. While nominations for membership on each TAC are made by the student with guidance from the mentor, the composition of each TAC is subject to the approval of the Program Director.

The student should ask each potential TAC member if she/he is willing to serve on the committee. Faculty members may decline if they feel they do not have adequate expertise, or if they have too many other commitments. Faculty agreeing to serve on a TAC should understand that they are expressing their willingness to work with the student and the advisor toward successful completion of the thesis on the project chosen by the student. Agreeing to serve on a TAC is a serious commitment to both the student and the student's advisor, and faculty members should make every effort to attend all TAC meetings, as well as the student's research presentations. Faculty members should be aware that their role is advisory and should be taken very seriously.

At the first meeting, the committee selects a chair. **The TAC Chair cannot be the thesis Mentor – the PI is an ad hoc member of the TAC.** The TAC chair is responsible for conducting the committee meeting and should guide the discussion of the meeting as necessary. The chair should also remind the committee of the goals set at the last meeting and make sure that progress toward these goals is described by the student. The TAC chair is also responsible for ensuring that a clear outline of the goals for the next period is presented.

At the beginning of each TAC meeting, the committee, student, or advisor may request time to meet alone with the student or advisor to determine if there are special concerns that need to be addressed. The TAC chair is responsible for writing the committee report, circulating it to committee members for approval, and providing a copy of the final report in a timely manner to the Program Coordinator and through the Coordinator to the student, the mentor and the Tufts GSBS.

Career Planning

All 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>.

RESEARCH, CAREER PLANNING, AND THESIS

- 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. Students 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 will complete this form and submit it to their Thesis Advisory Committees along with their research reports for discussion at a TAC meeting. It is the responsibility of thesis committees 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.science-careers.org/>. They may also talk with their mentors, Student Advisors, the Program Directors, or Associate Dean about career planning, in addition to their Thesis Advisory Committee.

Thesis Advisory Committee Meetings and Assessment of Research Progress

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

Subsequently, two meetings a year, one in the fall semester and one in the spring semester, will be necessary for satisfactory performance in the graduate research course. 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 subsequent term. **An incomplete in the spring semester must be completed by the end of the summer semester.**

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 who records the grade on the student's transcript.

It is recommended that one of the meetings occurs after the student's research presentation in the Student Workshop. Common mistakes made in preparing reports include lack of figure legends and page numbers, descriptions of experiments which are incomprehensible, failure to remind readers of important background material or provide diagrams that summarize what is known about the process being studied, failure to describe the rationale for experiments or changes in direction, and not distributing the report in a timely fashion.

Thesis committees are expected to offer feedback and advice on the student's oral and written presentation skills.

First Thesis Advisory Committee

In consultation with the thesis advisor, the student should prepare a detailed written description of the thesis research proposal that is distributed to the Thesis Advisory Committee members at least three working days before the first meeting. The proposal may be single-spaced. It should contain the following parts:

1. Title Page: Include date and location of the Thesis Advisory Committee meeting.
2. Summary (½ - 1 page): This is a short prelude to the Specific Aims. It should include introductory statements that (a) highlight the importance of the work, (b) distill the current knowledge into a few sentences and set the scene for what you propose to do, and (c) explain the knowledge gap that your work will address. In addition, you should clearly state your long-term goal, your short-term objective, and the hypothesis that you will be testing. This section should then lead into the Specific Aims.
3. Specific Aims (½ - 1 page): The Specific Aims (generally not more than four) explain how you will test your central hypothesis. Give each Aim a header and follow with an explanation of the specific problem, a brief description of the approach, and a brief description of the expected outcome. Conclude the Specific Aims with a paragraph that (a) emphasizes any ways your approach is innovative or uniquely suited to address the problem and (b) explains what will be possible after this research is completed that is not possible now.
4. Background (1-2 pages): This should summarize information in the field that is important for the committee to know in order to evaluate your proposal. This is a good place to include models and diagrams.
5. Significance (½ page): Expand upon why other people should care about this work.

RESEARCH, CAREER PLANNING, AND THESIS

6. Preliminary Data (if available): Include a discussion of how this data supports the proposed work.
7. Experimental Design (2-4 pages): This section should emphasize the order in which the experiments are to be conducted with pitfalls and branch points clearly identified. The general approaches to be used should be stated but detailed methodology should not be given unless the experiments involve major departures from techniques that are commonly used.
8. Concluding Paragraph: Restate what you hope to accomplish, why it is important, and how it will advance the field. Reiterate key points about the significance and potential of your proposed research.
9. References: Include titles and a full author list.

The committee decides if the proposed thesis project is a suitable basis for a doctoral degree. The committee may suggest alterations before accepting a proposal.

End of the Third Year Thesis Advisory Committee Meeting

At the end of the third year of research, the student will submit a more complete report and the committee decides whether or not the current project has the potential to be a successful thesis.

The student progress report for the end of third laboratory year committee meeting should start with an Introduction that highlights the significance of the thesis research and clearly states the hypothesis that is being tested and the Specific Aims of the project. The guidelines for this section are the same as those described for the Thesis Proposal above. The Introduction should be followed by a clear and concise summary of the work completed so far, the remaining goals of the project, and how this work will be organized into a thesis. The experiments that are projected to fulfill the remaining goals should be outlined briefly.

The committee will rigorously evaluate the overall progress in achieving the goals of the thesis project and the likelihood that remaining goals can be achieved. In the case of a positive evaluation, the committee will be acknowledging that, barring unforeseen developments, it is confident that the project will lead to successful completion of the thesis research.

In the case of a negative evaluation, the committee chair will draft a report detailing the committee's objections to the project. The student and advisor will have one month to respond in writing to the evaluation. The following responses are possible: 1) the student and advisor disagree with the committee and have decided to proceed with the project and have formed a new or altered committee to guide the work, 2) the student and the advisor have decided to pursue a different project and interact with the same or a different thesis committee as appropriate, or 3) student has decided not to pursue the project and requests to change laboratories. The faculty will be apprised of the outcome of the evaluation at the final faculty meeting of the academic year.

It is important to note that a positive committee evaluation at the end of the third laboratory year does not guarantee a degree. In addition, it is extremely important to understand that a negative evaluation at this point does not rule out the possibility that the student can successfully complete the dissertation with the project in which the committee does not have confidence. The goal of a negative evaluation is to send a clear danger warning about the project to the student and the advisor.

Final Thesis Advisory Committee Meeting

The Thesis Advisory Committee determines when a student has completed sufficient work to prepare their thesis. When a student has reached this point in their training and obtained approval to finish up final experiments and work on writing the thesis on a full time basis, s/he is excused from some program activities, including seminars, workshop, journal club, and the retreat.

To obtain permission to defend the thesis, a student, after consultation with the advisor, must present the thesis committee with the following information.

- Outline of the thesis Results Section. The outline should be organized in chapters, delineate the major findings, highlight their significance, and be accompanied by a list of figures and tables.
- An abstract. The abstract of the thesis work should be approximately 250 words.
- A list of remaining experiments. If any experiments remain to be completed, these should be described and a timeline for their anticipated conclusion should be given.
- Choice of outside examiner. The student also needs to inform the committee as to the choice of outside examiner.

Usually the student only seeks permission to defend when all or nearly all experiments considered necessary for the thesis have been completed. It is anticipated that very little bench work will remain once the committee gives permission and that no experiments critical to an acceptable thesis will remain to be completed.

The student and advisor should make every effort to reach an agreement concerning the material to be in the thesis prior to the committee meeting. If the student and the advisor are not in full agreement concerning the thesis content, the work remaining, or a schedule for experimentation or writing, these issues should be laid out clearly for the committee to evaluate.

Upon evaluation of the outline and the timetable, the committee will decide whether to grant permission to defend. In granting permission, the committee is not guaranteeing the degree but merely stating that they feel the body of work presented to them is sufficient for the thesis.

All committee members, including the thesis advisor, must be present at meetings where permission to defend is considered. It is important to note that permission is a formality

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in that many students elect to write large sections of their thesis before their final committee meeting. Often this is to the student's benefit because it expedites the process of preparing the thesis. The defense date must be set within three months of receiving permission.

Selecting an Outside Reviewer

Each student, after consultation with their advisor, should propose an individual as an outside examiner at the final committee meeting. If the student is uncertain about the willingness or availability of the first choice, several names may be proposed. The committee can approve all or some of the choices and offer additional suggestions. 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.

Either the student or the advisor may make the initial contact with the outside examiner. Once a person has agreed to serve on the committee, the outside examiner will be contacted by the chair of the committee concerning the mechanics of the defense procedures. If the outside examiner is from outside the Boston area and you wish to seek support for travel/lodging for this individual, prior approval by the Program Director is required. Any costs for an out of town outside examiner are the responsibility of the thesis advisor, not the Genetics Program.

The student should provide the outside examiner with a copy of the thesis outline and any papers or manuscripts that have been submitted once the individual has agreed to read the thesis. The student should also be prepared to go over this material with the outside examiner if requested to do so.

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 who completed their thesis research at The Jackson Laboratory may decide if they would rather hold their defenses at JAX or on the Boston Campus.

Students distribute their theses to their Thesis Defense Committee members approximately 2 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 approximately 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, all public presentations will take place 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 at The Jackson Laboratories

Public presentations should also be available remotely for faculty and students on different campuses. 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.

It is expected that all members of the Thesis Advisory Committee (TAC) plus the approved outside examiner will be physically present at both the public presentation and closed discussion. However, if necessary and unavoidable, up to one committee member may be remote for the presentation and discussion. During social distancing and limited on-campus presence, thesis presentations and discussions may be held remotely.

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 Policy, governing thesis revisions and continued receipt of a stipend, is in the Student Handbook (<https://gsbs.tufts.edu/studentLife/StudentHandbook>).

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*Not accepting new students

Name	Location	Phone	Email
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