

PROGRAM IN EXPERIMENTAL AND MOLECULAR MEDICINE

I. ADMINISTRATION OF THE PROGRAM

The Director of PEMM is appointed by the Dean of the Medical School. The Director is Chair of the Executive Committee that has the responsibility to oversee the graduate program. The Executive Committee is comprised of senior representatives from the major departments in PEMM plus representatives from each of the five areas of concentration (hereafter called “themes”).

The Graduate Committee is a sub-committee of the Executive Committee which consists of at least one faculty representative from each theme. Its responsibility is to facilitate the selection and admission of the applicants, and monitor the progress of each new student until he/she selects a specific theme and a thesis advisor. The committee will also review the academic performance of all students in the PEMM program. The Graduate Committee will usually be chaired by the Director of the PEMM program.

Each theme has a Graduate Education Committee (GEC) which provides oversight of the curriculum requirements of their theme, approves the composition of the student’s Thesis Advisory committee, oversees the grant writing/qualifying exam, and serves in an advisory capacity to the Executive Committee.

II. QUALIFICATIONS AND REQUIREMENTS FOR ADMISSION

The basic requirement for admission is a bachelor's degree with adequate preparation in chemistry, biology, biochemistry, physics and mathematics. A demonstrated proficiency with the English language is also required. A Graduate Record Examination score is required except in the case of applicants to the M.D./Ph.D. program where a Medical College Admissions Test score is acceptable. In addition, the applicant must supply at least three letters of recommendation, all official academic transcripts and a completed Dartmouth College application form for graduate study. It is the long-standing policy of the College to actively support equality of opportunity for all persons regardless of race or ethnic background, and no student will be denied admission or be otherwise discriminated against because of race, color, sex, religion, age, national or ethnic origin.

III. REQUIREMENTS FOR A Ph.D. DEGREE

REQUIRED:

Two-term core course (PEMM 101, 102)

Three research rotations in first year (PEMM 141, 142, 143)

Biostatistics course (PEMM 103)

Ethical and Responsible Conduct of Research (UNSG 100 for fall term and PEMM 124 for Winter Term)

Four elective courses

The preparation of a written grant proposal and oral defense (PEMM 137)

Attendance at and participation in journal club meetings, RIP (Research in Progress) sessions and seminars. Students will be expected to present at a journal club every year, and present their research annually starting in year 2 in either a RIP or seminar format.

Preparation and presentation of a thesis (seminar and defense)

The following courses represent the typical electives for a student in each area of concentration:

Biomedical Physiology

Year 1 PEMM 271 - Advanced Biomedical Sciences (2 course equivalents)

Year 2/3 Two additional elective courses

Cancer Biology & Molecular Therapeutics

Year 1 or 2 PEMM 126 - Cancer Biology

Year 2/3 Three additional elective courses

Cardiovascular Diseases

Year 1 PEMM 275 – Cardiovascular Diseases

Year 2/3 Three additional elective courses

Molecular Pharmacology, Toxicology & Experimental Therapeutics

Year 1 or 2 PEMM 131 - Current Approaches in Experimental Therapeutics

Year 2/3 Three additional elective courses

Neuroscience

Year 1 PEMM 115 - DMS Year 1 Neuroscience course with supplemental experimental neuroscience section (2 course equivalents)

Year 2/3 Two additional elective courses

A full time student must register for 3 course equivalents each term. In the early terms, this will include a research rotation, and one or two courses. If necessary, the appropriate thesis research number will be used to maintain the required 3 credits each term. PEMM 297 equals 1 course credit, 298 equals 2 course credits, and 299 equals 3 course credits.

ELECTIVES: An outline of the plan for electives must be developed with the student's advisory committee once established. Electives may be selected from courses offered by the Program and also by other graduate programs in the Medical School or Departments in the College. The criteria for approving a course for graduation reside with the student's advisory committee.

EXCEPTIONS: Advanced students joining the PEMM program will receive appropriate credit for comparable courses successfully completed in a former graduate program.

IV. RESEARCH ROTATIONS

Concept

A brief introduction to specific aspects of research provides the student with a general appreciation of various research areas and approaches. The purpose of the research rotations is to allow the student to obtain basic training in a variety of laboratory techniques and methods, and to identify a faculty member as a potential thesis advisor.

Expectation

The rotations will be assigned by the Graduate Committee taking into consideration the preferences of the students and availability of working space and resources of the faculty laboratories. The first rotation will be assigned by the Graduate Committee based on a list of three faculty members to be submitted by the student no later than one month prior to starting the program. The second and third rotation assignments will be determined once the student has had an opportunity to meet with individual faculty, and discuss areas of mutual research interest. A list of preferences for both the second and third rotations should be submitted to the Graduate Committee no later than one month prior to completing the first rotation. A delay in selecting potential rotation advisers may limit the choice available. The Graduate Committee will make every effort to match assignments with preferences.

At least two of three rotations must be performed with members of PEMM. It is expected that the three rotations will be completed within nine months and written justification must be submitted to the Graduate Committee for permission to extend any one research rotation beyond one quarter.

Upon completion of a rotation, a written report must be submitted to the rotation advisor for discussion and evaluation and to help in the determination of a grade for the rotation. A copy of the report must be submitted concurrently to the PEMM administrator. These reports should generally be between 5 and 10 pages plus figures and/or tables, and written in the form of a scientific publication (see Appendix I for suggested format). A rough draft of this report must be submitted to the rotation advisor before the start of the next rotation; a student will not be permitted to start the next rotation until the first draft has been submitted. The rotation advisor may return the report within 2 weeks with suggested revisions. The final report must be submitted to the advisor no later than 3 months after completion of a rotation. The faculty member will submit a copy of the report and a grade (HP, P, LP, NC) to the PEMM Coordinator. Reports submitted after the required time frame will not be eligible for a grade of HP. A student must obtain a passing grade in three rotations; a fourth rotation may be taken to achieve this end if necessary. It is expected that a thesis adviser will be selected from one of the three rotations; only under exceptional circumstances will a fourth rotation be permitted.

Exemptions

A student with extensive experience in a specific area of research relevant to the graduate training program may petition the Graduate Committee for an exemption of one research rotation.

Selection of advisor and theme

The thesis advisor should be identified no later than June 1 of the first year of study. Once the student and advisor have identified a potential area for the thesis research, the student's Thesis Advisory Committee must be formed (see below). This committee will also serve as the Thesis committee at the time of the defense of the thesis.

All sponsoring faculty in conjunction with their students should attempt to secure individual support for each student either through pre-doctoral fellowships or by the inclusion of salary support as graduate research assistants in grant applications. Graduate students will be encouraged to apply for individual fellowship support during their graduate training period.

Students may choose to perform their thesis research with a faculty member in a graduate program other than PEMM. This may require that the student transfer to the graduate program of that advisor. An exception to this policy can be made if there are specific circumstances whereby the student and advisor agree that remaining in PEMM is in the best interests of the student's training. These circumstances must be outlined in a letter to the PEMM Executive Committee who must approve the request before the student can begin the thesis research.

V. QUALIFYING EXAMINATION FOR THE Ph.D.

Philosophy and purpose

Effective writing of grant applications is required for a successful career in research. The grant application component of the graduate program is both a training exercise to help develop grantsmanship and a qualifying exam. Learning how to compose a defensible hypothesis is an essential component of the training of a graduate student. Students should be able to develop a novel line of research, propose a hypothesis, and develop a series of experiments to test this hypothesis. A student must be able to defend the proposal at an oral examination. At the same time, the student should also demonstrate knowledge of the larger field of Experimental and Molecular Medicine reflected in the general area of the proposal. The ability of a student to accomplish this endeavor will represent the qualifying exam, which should be submitted no later than December 1 of her/his third year in the graduate program.

Selection of subject

The student's thesis research or other research in the adviser's laboratory is not an acceptable subject for the proposal; for many students this would require only reiterating hypotheses regularly discussed within their research group and at meetings with the student's Thesis Advisory Committee. The student's grant application must have a hypothesis and aims that are independent from any ongoing or pending projects of the adviser. The main criterion to be used

in this regard is that the student be responsible for the development of his/her own ideas and that the hypothesis is novel. The topic of the proposal must be approved by the appropriate theme-specific Graduate Education Committee (GEC), which may seek advice from the students Thesis Advisory Committee as to whether the application fulfills the above guidelines.

An important component of a grant application is preliminary data that provide justification for the proposed hypothesis. The student will usually use published papers as the source of the preliminary data. In developing a grant application, it is beneficial to select one or more recent original papers on a topic related to the chosen theme, and from which the student is prepared to develop a hypothesis and write a grant application. This paper(s) must also differ from any paper presented in a Journal Club. The paper(s) must be submitted to the GEC along with the hypothesis to be tested and a brief paragraph of explanation. In developing a hypothesis, the student should keep in mind a variety of possibilities and alternative hypotheses. For example, the hypothesis could be derived directly from conclusions in this paper, it could involve an alternative possibility not discussed in the paper, it could contradict the paper, or it could present a hypothesis to resolve contradictions among several papers. Furthermore, in developing the hypothesis, the student should consider whether the proposed experiments will lead to a significant impact on human health. The GEC will determine if the hypothesis is appropriate for the basis of the grant application. If the GEC decides that it is not, then the student must select another subject and paper(s) and repeat the process. The “preliminary results” in the selected paper should be presented in the preliminary results section of the grant application.

Role of the student’s thesis advisor

The thesis advisor should play a significant role in the grant writing by acting as a mentor to the student. Each student should discuss the proposal with his/her advisor at every stage, particularly during selection of the subject and paper(s), while developing the hypothesis, the specific aims, and again as the application is nearing completion. The advisor is expected to help the student with style and format, but to limit input regarding specific scientific ideas. Students are strongly advised to submit a draft of the grant application to their advisor well in advance of the deadline so that the student can benefit from this important feedback.

Timeline

The paper(s), the attached hypothesis and explanation must be submitted to the GEC for approval no later than August 1 of the second year of study although earlier submission is strongly recommended. The GEC will determine if the topic is suitable for preparation of a grant application and return the recommendation to the student within 2 weeks.

The student will then have two weeks to submit the specific aims to a three-member examination committee selected by the GEC. This committee must contain at least one member of the GEC who will usually serve as chair of the committee. The advisor is not a member but will be an observer at the oral defense. This examination committee will provide additional feedback to the student regarding potential pitfalls in the project. The student will not be required to resubmit specific aims but should take this advice into consideration while writing the application.

The deadline for submission of the completed application will be December 1 although this does not preclude earlier submission. Early submission of the hypothesis, or the specific aims is encouraged, as this will provide more time for completion of the grant application. Additional guidelines for preparation of a grant application are included in Appendix II of this document.

Defense of the grant application

The application must be submitted by the established deadline (summarized below). It will be reviewed within 2 weeks by the examination committee. The committee may recommend an oral defense, deferment or rejection. In each case, the student will be provided with a critique that will highlight the most important questions and concerns of the committee. It is expected that an oral defense (if recommended) will occur within one month of submission.

If recommended for oral defense, the student will present an overview of the proposal, including a discussion of the comments in the critique. The student should also be prepared to address any related scientific or technical aspects that the committee may raise. A major goal of the defense is to determine the student's knowledge and ability to "think on his/her feet." The committee may meet in advance of the oral defense to define the most pertinent questions that warrant appropriate answers. Based on the response to these questions, and the overall quality of the application, the committee may recommend pass or fail; in the case of a pass, the committee will assign a grade of HP, P or LP.

A decision on the written proposal may be deferred if the committee believes that the application has merit but requires rewriting. The major reason for such a decision will be that the student would benefit from additional practice at formulating ideas and presenting them in a clear and succinct proposal. The proposal must then be resubmitted within a month, with a site visit to follow within 2 weeks. The committee may recommend pass or fail; in the case of a pass, the committee will assign a grade of P or LP.

If the application is graded NC, either in its original form or after the oral defense, this grade will be filed with the registrar. If the student has not previously received a NC grade or two deficient grades (either LP or NC; see Section VII), the student will have one chance to repeat the exam. A new subject and paper(s) will be selected and a new committee will be formed. The time frame for resubmission must not exceed 6 months from the date of recommendation.

Summary of suggested timeline

Jan/Feb	Orientation of students to grant writing exercise
August 1	Student submits a paper(s) and hypothesis to the GEC
August 15	GEC notifies student if hypothesis is appropriate
September 1	Specific aims are submitted to Examination committee
September 15	Examination committee returns advice to student
December 1	Student submits completed proposal to exam committee
December 15	Examination committee returns comments to student

January 15

Oral defense

This schedule shows the latest acceptable dates. Students may begin the qualifying process at any time after January 1 of their second year and thereby extend the amount of time available to them to complete each step.

VI. THESIS RESEARCH

The goal of the Ph.D. program is to prepare students for a successful research career whether it is to be in an academic, government or industrial environment. This is achieved primarily through the pursuit of an independent research project in the laboratory of a faculty adviser. To ensure that students graduating from the program are of high quality and consistent with the philosophy that students should make a meaningful contribution to their field, it is expected that, by the time of the dissertation defense, the student will have published first-authored, experimentally based manuscripts in peer-reviewed journals. Often the best thesis represents the work contained in two or more papers (perhaps several published and others submitted), and in such case, the student will be able to use these as the body of the thesis, which will then be framed by an introduction and final discussion. It is worth emphasizing that a strong publication record is essential to the student in achieving her/his long-term career goals.

Student Advisory Committee

The Thesis Advisory Committee will be established immediately upon selection of a mentor. This will be done by the student and the advisor and must include a minimum of four members, two of whom must be PEMM faculty and one of whom must be from another Institution (the latter member is often appointed after the student has been in the program a couple of years). The GEC must approve the membership of the Thesis Advisory Committee and the chair of the GEC will be an *ex officio* member of all thesis committees. The intent is to assemble a group of consultants with whom the student should meet on a regular basis to discuss aspects of her/his research project and curriculum. The Thesis Advisory Committee must meet at least once a year. Meetings may be scheduled on a more frequent basis at the request of the advisor, the Thesis Advisory Committee or the student. A brief status report must be submitted to the Thesis Advisory Committee at or before the time of the meeting. This report should reflect the progress and the problems encountered with the thesis project, and also the status of course work for those students who have not yet completed their requirements. This report and a brief summary of the meeting must be submitted to the GEC coordinator within one week of the meeting.

Thesis Defense

The Thesis Advisory Committee must certify that the student is ready to submit his/her thesis. The thesis will be submitted to the Committee and a date for the Defense seminar will be established. There must be at least 14 days between submission of the thesis and defense to permit adequate review of the thesis. If the Committee determines that the thesis is not ready for oral presentation, they may cancel the defense no later than 7 days in advance of the proposed date. The seminar will be open to the public and will be widely announced. The Seminar will be

followed by a defense of the thesis conducted by the Thesis Advisory Committee. Corrections to the written document must be made within one month or as determined by the Thesis Committee. Recommendations for awarding the Ph.D. degree will be made by the Director of PEMM upon the advice of the Advisory Committee.

VII. GRADING STANDARDS FOR STUDENTS PURSUING A Ph.D. DEGREE IN THE PROGRAM IN EXPERIMENTAL AND MOLECULAR MEDICINE

The following standards of performance are those expected to be achieved by every student while fulfilling the course requirements for the degree of Ph.D. Failure to meet these standards may result in separation from the program. Review of the academic performance of all students will reside with the Graduate Committee who will be advised by the appropriate theme-specific GEC.

1. Graduate students shall be graded according to the scale; High Pass (HP), Pass (P), Low Pass (LP), No Credit (NC). An “incomplete” grade may be filed under special circumstances, but the requirement must be fulfilled and a final grade filed within one year.
2. A minimum grade of "Pass" is expected in all courses. The Graduate Committee will review the record of any student who receives a Low Pass (LP) or "no credit." A minimum requirement for graduating will be an average grade of Pass in the four thematic courses.
3. A review of performance by the Graduate Committee will result in a recommendation that
 - (a) no action is necessary
 - (b) the receipt of a "Low Pass" or "No Credit" grade constitutes a deficiency which must be removed either by repetition of the course, special examination or other arrangement.
 - (c) the student discontinues the pursuit of a Ph.D. degree in the Program in Experimental and Molecular Medicine.

At the discretion of the Graduate Committee, recommendations 3(a) and 3(b) may be brought before the Executive Committee for approval. In the event that the Graduate Committee recommends 3(c) as the most appropriate action, this recommendation will automatically be brought before the Executive Committee for final approval.

4. The Committee will use the following guidelines for arriving at a recommendation (the term “course” includes grades obtained in the qualifying exam).
 - (a) If a student receives a grade of "Low Pass" in a course, the Committee may recommend options 3(a), (b) or (c).

- (b) If a student receives a grade of "No Credit" in any course, or "Low Pass" in any two courses, options 3(b) or (c) must be followed
- (c) If a student receives a grade of "No Credit" in any two courses the Committee must recommend option 3(c).
- (d) If a student receives more than two deficient grades (either LP or NC) the Committee must recommend option 3 (c).
- (e) If a student fails to sufficiently improve his/her performance (as judged by the Committee) within one academic year after a performance review recommendation, the Committee must recommend option 3(c).

VIII. M.S. DEGREE REQUIREMENTS

While the primary goal of the PEMM graduate program is the pursuit and award of a Ph.D. degree, occasionally students will choose to terminate early with the award of an M.S. degree. The requirements for M.S. degree are as follows.

1. Successful completion of the following courses
 - a) PEMM 101 and 102
 - b) Biostatistics course (PEMM 103)
 - c) Ethical and Responsible Conduct of Research (PEMM 124)
 - d) 2 elective course equivalents
2. Completion of three rotations (PEMM 141, 142, 143)
3. Participation in Journal Clubs, Research in Progress and Seminar series
4. Research Thesis to be read by a committee of three faculty (a member outside of Dartmouth is not required)
5. Public Seminar related to thesis work (the research-in-progress presentation is an acceptable forum)

IX. VACATION AND LEAVE POLICY

The normal appointment to a position in the Graduate Program is full-time with no more than 20 days of annual vacation. This time allowance includes the official holidays granted to Dartmouth College employees. Arrangements for leave must be made in consultation with the student's faculty adviser and should not compromise fulfillment of any obligations regarding coursework or research activities required of the student. It is usually inappropriate to take vacation during the first year in the program because of the need for timely completion of research rotations and selection of a thesis advisor by June 1.

In some instances it is appropriate for a student to spend time away from Dartmouth in other laboratories, and such experiences should be planned in consultation with the student's advisor. Time spent in such activities does not count as vacation.

Under the child accommodation policy, a full-time stipend-supported graduate student is eligible for up to twelve weeks of paid accommodation from his or her graduate program.

X. STUDENT GRIEVANCE PROCEDURES

The committee-based process for guiding the graduate program, while primarily designed to ensure effective mentoring, is also intended to guard against biased treatment of any individual. Although rare, allegations can occur of professional misconduct (e.g. cheating, plagiarism, data alteration, conflict over data ownership or access, etc.), personal misconduct (e.g., sexual impropriety, harassment, etc.) or simply distraught people caught in a stressful mentoring relationship that appears to require an unbiased third party for resolution. The latter situation can arise when there is a misconception from either faculty or student about expectations for what constitutes satisfactory progress.

The guidelines for the graduate program have been developed to ensure adequate communication between students and Program faculty. On joining PEMM, all graduate students will meet with the Director and members of the Graduate Committee who will oversee their progress during the first year. Upon selection of a research theme, a student will be overseen by a Graduate Education Committee. Once a research adviser has been identified, the Thesis Advisory Committee will be established, and this committee is mandated to meet with the student at least annually. These guidelines will avoid the situation whereby student progress is being monitored by a single individual without input from other faculty who can provide a broader assessment of progress. This level of oversight protects everyone by helping to ensure a fair, transparent and justifiable process.

We have also established a grievance process to ensure that student grievances will be investigated fully and fairly, treated confidentially and decisions rendered in a timely manner. In general, these issues are best moderated internally. With an effective oversight/grievance committee structure, few grievances or disputes will reach the stage where they require formal resolution. However, when program and informal resolution is not feasible or successful, the graduate office is the next place to turn. When grievances can not be resolved by speaking directly to the person who bears responsibility for the complaint or who is the alleged cause of the complaint, then the student should discuss the issue with the next closest individual with whom they feel comfortable in addressing their concern.

1. Speak to the graduate adviser
2. Speak to other members of the Thesis Advisory Committee, or to the appropriate Graduate Education Committee or the PEMM Graduate Committee

3. Speak to the Director of the theme, the Department Chair, and/or the Director of PEMM.
4. If a satisfactory resolution can not be reached within the Program, the aggrieved student may request a meeting with the Dean of Graduate Studies to discuss the issue.
5. If the Dean, working together with the aggrieved student and appropriate faculty member(s), or representatives of the graduate program is unable to reach a satisfactory resolution, the student can request in writing a formal hearing and ruling by the Dean of Graduate Studies and the Committee on Student Grievances. Formal hearings are conducted as described *in the Graduate 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 Graduate Office.

Appendix I

Guidelines for writing a rotation report

Writing a rotation report is an important exercise in learning how to write a paper. Before you begin to write, get a few papers related to your topic from good journals that use a format similar to what a lab report should be. Examples would be *Cell*, *JBC*, *Genes and Development*, *Cancer Research* and *Molecular and Cellular Biology* (MCB). Short-form journals such as *Science* or *Nature* would not be appropriate. See how these experienced authors present their work and try to present your work in a similar fashion. For example - read their *Introduction* or a sub-section in their *Results* section and then try to pattern your sections after theirs.

Abstract

In 250 words or less (this is usually a real challenge)...

Describe the major question you are trying to answer or problem you are trying to solve.

Describe why it is important.

Describe your experimental approach to the problem.

Describe your major result(s)

Describe your major conclusion(s) from the results.

Introduction

Here you should give the background of your project.

Give the history of the problem you are working on to put your work in context. How does it fit into the larger picture of the system you are working in (i.e., role of metalloproteinases in tumor metastasis, initiation of apoptosis by Fas ligand, development of more efficient retroviral vectors, etc.)

Describe previous results from other labs and yours.

Make sure you explain why your question, system and approaches are unique and important. Make your work sound interesting. Make the reader want to read on to find out how you solved your problem or tested your hypothesis. If you can't be excited about your work then other people are unlikely to be.

Describe the system you are using and why it is appropriate for your work.

Results should not be presented in the introduction section although many papers will frequently conclude with a brief statement of what was discovered.

Methods

Succinctly detail the source of materials and the specific methods used. Do not reiterate established methodology, but reference appropriate sources that would provide this detail.

Results

In this section you are essentially telling the story of how you attacked a problem. It should be written to logically guide the reader step by step through your research. Each step should make sense to the reader.

You should have a separate section for each experiment or closely related set of experiments you do.

Each of these should address (and hopefully answer) a specific question or test a specific hypothesis.

Each section should have a specific title (i.e., *Proteins binding to the HSFE* or *Cloning of gene X* or *Effect of the 3' enhancer of gene expression*, etc.)

Each section should contain

1. An explicit statement of the problem or hypothesis to be tested (i.e., In this experiment we tested the hypothesis that ...).
2. A statement of the rationale for your experiment(s) - explain why it is important.
3. A specific description of the experimental approach you used (this differs from the methods).
4. Description of the results of your experiment. Verbally walk the reader through your results, step by step. This often amounts to describing a gel or other figure. Be sure to note the importance and appropriateness of the controls you used.
5. Conclusion - Briefly state how the results of the experiments relate to your original hypothesis or the problem you were trying to address. Have you tested it successfully? What is the outcome of your testing?

The next section should describe the next logical step in your approach to your overall problem. It usually builds on, or follows from, the results of the previous section.

Figures need an explanatory legend, but a good figure can usually be understood simply from looking at the figure if it is appropriately labeled. Cite each figure in the text as Fig. 1, 2, etc.

Discussion

Here you should begin by very briefly (once again) stating the overall goal of your research.

Then pick your most significant and interesting results to highlight and discuss how they are relevant to research in your chosen system as well as beyond the focused scope of your paper.

Each major discussion point will often have its own sub-heading (if there are enough points that need to be discriminated)

For a rotation report you should discuss what the next logical steps in the research would be. If you ran into problems, how would you try to get around them if you were continuing on with the project.

The last paragraph is usually makes a rather grand statement on the relevance and importance of the work.

References

Cite references in appropriate places throughout the report, and list them at the end.

Use a consistent reference style based on a journal format that you choose. A format that includes the title of the article is generally most informative.

References generally include authors, title, Journal, volume, first and last page and year (not always in that order). They rarely include the issue number, month or day of publication.

Length

A rotation report can be concise. We are not looking for a thesis, but a focused and brief report. A typical length might be 5 - 10 pages excluding figures and references.

Appendix II

Specific instructions for student grant applications.

1. Write a 10 page grant application including references (Do not let references run over 1 page). Acceptable fonts and margins will be as mandated by NIH (Ariel or Helvetica 11 point; a minimum of 0.5 inch margins on all sides). It is recommended to leave a double space between paragraphs to avoid the grant appearing “dense.” Examples of grant applications will be made available in the PEMM office.
2. The application should propose 3 years of post-doctoral work for yourself at full time effort.
3. The application will be on a subject unrelated to your thesis or related research in your laboratory. You can include techniques with which you are familiar, but you are expected to develop a novel series of experiments.
4. Present a testable hypothesis and plan a series of experiments to test it. Justify it as much as possible. Note that a hypothesis does not have to be true; the grant is designed to determine whether it is true. Even if the hypothesis is eventually disproved, the grant should still be able to produce valuable data and future research.
5. The introduction should provide adequate background to justify the hypothesis. An introduction that addresses only the area of research but fails to build up to the hypothesis is inappropriate.
6. Each aim should represent a series of experiments, not single experiments. A series of experiments means that after your initial experiments, you should discuss the possible outcomes, and propose experiments based on these outcomes. Discuss the potential results of the subsequent experiments as well. Note potential pitfalls and possible solutions; this can be presented throughout or as a separate section. Discuss alternative hypotheses.
7. Do not base your application on a single initial experiment. A lethal flaw in a proposal results if the first experiments might fail or are not possible, and the remainder of the proposal is predicated on the success or specific outcome of the first experiments.
8. You will not be expected to have preliminary data of your own, but you should briefly present the pertinent results of the selected paper(s) in this section. These would be the results you would hope to get, if you had an initial seed grant. Do not make up any data that are not published. A copy of this paper should be submitted as an appendix to the proposal.
9. Focus most of the experimental section on presentation of the experimental design. Do not go into extensive details of established methodology; a brief comment to confirm that you understand the methods is adequate as long as a reference is provided.
10. Assume that all the necessary resources and equipment will be available to you.

11. When antibodies, cell lines, plasmids, mice etc. are required, assume that if they have been published, they will be provided to you by the authors of that paper. Make sure you cite the source. Do not get letters of collaboration in this regard (they would be needed if the application were to be submitted to a funding agency).
12. Discuss the long-range direction of the research program. What future studies might you perform based upon success of the current application?
13. In the real world of grant applications, many may be considered excellent. A fundable grant is one that has the greatest probability of generating a significant advance. Reviewers are asked to score significance and innovation. Be sure to discuss the originality of your proposal and demonstrate that it will have a significant impact on human health.