IMMUNOLOGY 607
GRANT WRITING
TUESDAYS - 10:00AM TO NOON
THE CLASS WILL MEET IN ROOM 1001 BRB2/3

PHONE NUMBERS & ADDRESSES

David Allman: 230 John Morgan Building
                215-746-5547
                email: dallman@mail.med.upenn.edu

Michael Cancro: 284 John Morgan Building
                 215-898-8067
                 email: cancro@mail.med.upenn.edu

Bruce Freedman 68E Old Vet Building
                (215) 573-8218
                bruce@vet.upenn.edu

Andrew Wells   916F Abramson Research Center (CHOP)
                215-590-8710
                adwells@mail.med.upenn.edu

COURSE GOALS & DESCRIPTION: The goals of this course are several:

First, we will introduce you to basic principles of grant writing. In this regard, a primary objective of the course is to teach you how to describe your ideas and experimental objectives in a clear and concise manner within the standard NIH grant format. To accomplish this, you will be required to write an NIH “RO1” type grant proposal based on your laboratory thesis project.

Second, we hope to give you some insights into how NIH grants are processed and reviewed. To this end, you will participate in three mock study sections in which you will evaluate and score actual grants. Immunologists here at Penn wrote the first two series of grants. You and your colleagues will write the third and final series. We will also be given a presentation from an NIH grants administration staff member who will provide you with a description of how grants are assigned to particular institutes and study sections at the NIH and how grant applications are processed after the review process.
GRADING

There will be no exams. Your grade will derive from the quality of the grant that you write, your written critiques of others’ grants, and your ability to explain your thoughts and reasoning during all three mock study sections. A breakdown of the grading strategy is provided below.

SUMMARY OF GRADE SOURCES AND MAXIMA

<table>
<thead>
<tr>
<th>Grade Source</th>
<th>Maximia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written grant proposal</td>
<td>100</td>
</tr>
<tr>
<td>Study sections I-II (participation)</td>
<td>20</td>
</tr>
<tr>
<td>Study section III (participation)</td>
<td>30</td>
</tr>
<tr>
<td>Written critiques of others’ grants</td>
<td>50</td>
</tr>
<tr>
<td><strong>MAX POSSIBLE TOTAL POINTS</strong></td>
<td>200</td>
</tr>
<tr>
<td><strong>MAX POSSIBLE FINAL SCORE</strong></td>
<td>100 (200/2)</td>
</tr>
</tbody>
</table>

The following “straight scale” grading system will be used to generate final grades:

- >97 = A+
- 87-89 = B+
- 77-79 = C+
- 93-96 = A
- 83-86 = B
- 73-76 = C
- <70 = D
- <60 = F

Grant proposal: Details on the content of RO1 grant proposals are given below and will be discussed at length in class. Your final proposal will be graded for your overall ability to express your experimental objectives in a clear, concise, and potentially fundable manner.

Mock study sections I and II: On both Sept 9th and Oct. 7th you will each be given copies of three or four RO1 or R21 grant proposals (some good – some bad perhaps) written by principal investigators here at PENN. You will also be able to download these proposals from the Blackboard web site. Everyone will be expected to read every grant and be prepared to discuss each grant including what you like and dislike about it. In addition, some of you will be assigned as a primary or secondary reviewer for one of these proposals. Two weeks later the entire class will meet to discuss the strengths and weaknesses of each proposal. The main objectives of this exercise are to introduce you to the RO1 format and the study section “culture,” and provide you with some examples of what makes a good as well as a not so good grant proposal. Afterwards, you will receive the actual summary statement for these grants written by reviewers of an NIH study section.

For each grant, the primary reviewer will provide a brief and succinct description of the proposal to the other members of the panel (class) such that others can ask key questions that everyone will use in formulating a final opinion about the proposal. The primary reviewer should discuss the overall strengths and weaknesses of the proposal, and be prepared to answer questions from other class members regarding the proposal. The secondary reviewer will then state whether he/she is in agreement with the assessments made by the primary reviewer, and add any additional insights that will help others generate a final score. After the primary and secondary reviewer’s comments, the proposal will be open for discussion by other members of the study section. Students will not be asked to provide written critiques of these proposals.

Mock study section III: After submitting your RO1 proposals, copies of all students’ grants will be given to each class member. You will be assigned as a primary and secondary reviewer on two of your colleague’s grants. As a primary and secondary reviewer for a given grant, you will be required to write a critique of the grant that discusses the strengths and weaknesses of the
proposal. These critiques should follow the general format of an NIH summary statement (see above) **All written critiques are due the day of this mock study section.**

As before, the entire class will also meet to discuss and assign scores to each proposal. The primary reviewer will provide a brief and succinct description of the proposal to the other members of the panel (class) such that others can ask key questions that everyone will use in formulating priority scores for each grant. The primary reviewer should discuss the overall strengths and weaknesses of the proposal, and be prepared to answer questions from other class members regarding the proposal. The secondary reviewer will then state whether he/she is in agreement with the assessments made by the primary reviewer, and add any additional insights that will help others generate a final score. After the primary and secondary reviewer’s comments, the proposal will be open for discussion by other members of the study section. Finally, everyone will generate a priority score based on the information given, and we will move on to the next grant.

Students will be graded on their written critiques and overall participation in this facet of the course.

**Writing your grant.** Similar to manuscript writing, grants are usually written in phases with one or more drafts for each section. For this course you will be asked to submit the first draft for each section at the dates specified in the SCHEDULE listed below. To submit your work you will need to create a pdf file of your work, then upload this file on the Blackboard web site. The faculty leader for your assigned subgroup will then evaluate the first draft for each section of your grant, and then we will meet in small groups (WORKSHOPS) to discuss how you might improve your work.

**Purpose of workshops.** As you will see below, we have scheduled several small group meetings or workshops throughout the course. Each of these occurs one week after the first draft for each section of your grant is due. These meetings will consists of 2-4 students plus one faculty member, and will provide the means for each of you to get direct one-on-one feedback on your work at that time. All members of a given workshop should read their colleagues proposals during the week leading up to each workshop.
<table>
<thead>
<tr>
<th>Date</th>
<th>Large meetings group</th>
<th>WORKSHOPS</th>
<th>Drafts due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept. 9</td>
<td>Elements of an RO1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept. 16</td>
<td>Mock study section I</td>
<td>Specific aims (Due on 23rd)</td>
<td></td>
</tr>
<tr>
<td>Sept. 23</td>
<td></td>
<td>Specific aims</td>
<td></td>
</tr>
<tr>
<td>Sept. 30</td>
<td></td>
<td>Revised Specific Aims + Background &amp; Significance</td>
<td></td>
</tr>
<tr>
<td>Oct. 7</td>
<td></td>
<td>Revised Specific Aims + Background &amp; Significance</td>
<td></td>
</tr>
<tr>
<td>Oct. 14</td>
<td></td>
<td>Mock study section II</td>
<td></td>
</tr>
<tr>
<td>Oct. 21</td>
<td></td>
<td>OPEN</td>
<td>Prelim Data section</td>
</tr>
<tr>
<td>Oct. 28</td>
<td></td>
<td>Prelim Data</td>
<td></td>
</tr>
<tr>
<td>Nov. 4</td>
<td></td>
<td>Exp. Design, Aim 1</td>
<td></td>
</tr>
<tr>
<td>Nov. 11</td>
<td></td>
<td>Exp Design, Aim 1</td>
<td></td>
</tr>
<tr>
<td>Nov. 18</td>
<td></td>
<td>Exp. Design draft due</td>
<td></td>
</tr>
<tr>
<td>Nov. 25</td>
<td></td>
<td>Experimental Design, all</td>
<td></td>
</tr>
<tr>
<td>Dec. 2</td>
<td></td>
<td>Visit by NIH official</td>
<td></td>
</tr>
<tr>
<td>Dec. 9</td>
<td></td>
<td>Final RO1 due</td>
<td></td>
</tr>
<tr>
<td>Dec. 16</td>
<td></td>
<td>Mock study section III</td>
<td>All critiques due</td>
</tr>
</tbody>
</table>
Elements of an RO1

The scientific portion of an RO1 and most other NIH grants is limited to 25 pages and consists of 4 sections: **Specific Aims, Background and Significance, Preliminary Data, and Experimental Design.**

**I. Specific Aims**

The specific aims page should state the problem at hand and briefly describe how you will solve the problem. Although the NIH does not provide a specific page limitation for this section, most would agree that the specific aims section should be no more than one page. In addition, it is important to avoid jargon, especially for the Specific Aims. It is generally agreed that the specific aims is the most important part of the grant; it sets the tone for the remainder of the grant and should provide the reviewer with a good idea of what you want to do and how, in general terms, you plan to do it. A general scheme is as follows.

Introductory paragraph stating:

a. The problem to be addressed and why it is an important problem - give the big picture.

b. What unique insights or abilities you have regarding this problem and how you utilize this unique advantage.

c. The general hypothesis to be tested.

Following the introductory paragraph, provide a listing of 2-4 specific aims that will collectively test the general hypothesis. Each of these can contain a very brief description of what you will do to accomplish your objectives.

**II. Background and Significance**

This section should provide the reviewer with a concise review of the current knowledge of the field and the significance of these studies and the proposed studies. This section should be roughly 3-4 pages at most.

**III. Preliminary Data**

Preliminary data pertinent to the proposed studies. A common flaw with many grants is when the conclusions drawn by the investigator are not supported by the data.

**IV. Experimental Design**

This section is usually divided into subsections for each specific aim. Aside from your specific aims page, this section is typically viewed as the most important part of the proposal. Your experimental plan needs to be detailed enough such that the reviewers can determine that you have both identified a clear and scientifically relevant hypothesis and developed an experimental plan that will without a doubt provide an answer. Each subsection should contain the following parts:

Rationale, Hypothesis, Approach, Interpretations, Potential pitfalls and alternative approaches.
**Glossary**

**CSR, center for scientific review:** The branch of the NIH assigned the task of reviewing all scientific proposals.

**Direct costs:** The fraction of a total grant budget that can be used by the principle investigator to perform the proposed studies. Also see indirect costs. Maximum direct costs for an RO1 are usually $250,000/year and a given RO1 covers no more than 5 years.

**Effort:** All budgets require that the per-cent effort, the fraction of a person’s total time, be specified for all relevant personnel.

**IACUC:** A detailed animal use protocol that must be submitted and approved by an institutional regulatory affairs department before a grant can be funded.

**Indirect costs:** The fraction of a total grant budget that is not available to the principle investigator. Instead, this money goes to the investigator’s institution and is used for general “overhead”.

**Modular budgeting:** A relatively new NIH policy states that all budgets are to be rounded up in intervals of $25,000. For example, if your detailed annual budget were $205,000, the modular budget for that year would be $225,000. Despite this policy, most institutions (including PENN) require a detailed itemized budget plan be submitted to institutional officials (with the grant) before they will sign the grant face page. Maximum direct costs for an RO1 are $250,000/year.

**Pay-line:** The cut-off for grant payment decisions based on the percentile ranking. Different NIH institutes have varying amounts of money; therefore the pay-line varies for each institute. For instance, last year’s pay-line at NCI was 18 but at NIAID it was 20. This means that a grant receiving a percentile ranking of 19 would stand a good chance of getting paid by NIAID but not by NCI.

**Percentile ranking:** After receiving a priority score, a grant is ranked with all grants reviewed by a given study section over the past year. The resulting ranking is expressed as a percentile ranging from 1 (best possible ranking) to 100. Institutional program officials use this number in decisions about which grants will actually be paid. See pay-line.

**Priority score:** A raw number score given to a grant at study section. Scores range from 100 (best possible score) to 500. Typically, scores better than roughly 200 stand a reasonable chance of getting funded.

**Program administrator:** NIH institutional staff. Make decisions about which grants are to be funded. Also make policy decisions about special funding initiatives (see PA, RFA).

**PA, program announcement:** NIH institutional announcements describing a desire of the institute to fund grants addressing a particular problem. PA’s typically ask for applications over a defined period of time. For example, the Aging Institute currently has a PA for applications dealing with stem cell defects and aging and NIAID recently announced several PA’s dealing with bioterrorism.
Program grant: A collection of RO1’s, usually from the same research institute, that share a common theme. Program grants provide a means to fund core resource laboratories such as the Penn Cancer Center Flow Cytometry Core Laboratory in the John Morgan Building.

RFA, Request for applications: Similar to a PA except these tend to be a one-time event.

RO1: Typical 5-year grant proposal.

RO3: “Pilot” grant proposal for a limited amount of funds and designed to allow investigators to investigate a new idea for which there is limiting supporting data.

R21: Two-year grant proposal to investigate risky but potentially high impact research projects.

SRA, scientific review administrator: CSR staff personnel assigned the task of running a given study section. These people have the often-difficult task of recruiting scientists with the appropriate expertise to review grants at study section.

Summary Statement: About 8-weeks after a grant receives a priority score and percentile ranking, the applicant receives a summary statement consisting of written critiques from the primary and secondary reviewers and budgetary recommendations. The summary statement can be used both by the applicant if a revised application is indicated, and by program administrators in making funding decisions.

Study section: A scientific review committee specializing in a particular field. Study sections review and assign priority scores for all assigned grants and are typically composed of the SRA, a chairperson, and 10-15 experts in the field that critique the grants to which they have been specifically assigned and vote on a priority score for every grant assigned to that study section. All study section members, with the exception of the SRA, are typically faculty members at non-government research institutions (such as Penn) who volunteer their efforts to the grant review process.

Triage: Unofficial term for when a study section decides NOT to score a particular grant. In real life, most study sections will not score (triage) roughly 50% of their assigned proposals. Such a decision is usually based on the argument that the proposal in question falls in the bottom 50% of all proposals to be reviewed.