IMMUNOLOGY 607 GRANT WRITING, Spring 2026

TUESDAYS - 10:00 AM to **12:00 PM** for large group meetings - as arranged for small group meetings

COURSE DIRECTOR: ANDREW WELLS

LARGE GROUP CLASSES WILL MEET IN ROOM 11-102B, 3600 CCB

FACULTY:

Andrew Wells - adwells@pennmedicine.med.upenn.edu

Taku Kambayashi - tkambaya@pennmedicine.upenn.edu

Jorge Henao-Mejia - jhena@pennmedicine.upenn.edu

Neil Romberg – rombergn@chop.edu

Michael Milone - michael.milone@pennmedicine.upenn.edu

Juan Matute - matutej@chop.edu

COURSE GOALS & DESCRIPTION: There are several objectives for this course: **1**) We will introduce some basic principles of scientific writing that, if followed, will help you achieve clear and concise writing. **2**) We will introduce the basic principles of grant writing in the context of the standard NIH grant format. To accomplish this, you will be required to write the Research Training Project portion of an NIH F30 (combined degree) or F31 (straight Ph.D.) grant proposal based on your own laboratory thesis project. **3**) We will provide insights into how NIH grants are processed and reviewed. To this end, you will participate in two mock study sections: one in which you evaluate actual NIH grants written and submitted by Penn investigators, and one in which you evaluate the proposals you and your colleagues write as part of the course.

Grant proposal: Details on the content of the F30/31 proposal are given below, and will be discussed at length in class and during workshops. Your final proposal will be evaluated for its ability to express the experimental objectives in a clear, concise, and potentially fundable manner.

Writing your grant. Similar to manuscripts, 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 for each week specified in the SCHEDULE listed below. You will coordinate with the faculty leader for your assigned subgroup on the scheduling of your workshops.

Purpose of workshops. These meetings will consist of 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 and be prepared to offer criticism and advice on how to improve the proposal. At each workshop you will evaluate each other's drafts and discuss how you might improve your work. Feedback will be at the level of the science proposed and how effectively it is communicated in the writing. *These workshops are intended to be student-driven with facilitation by faculty*.

Mock study section 1: You will be given F proposals written and submitted by students here at Penn. Everyone must read each grant and be prepared to discuss its strengths and weaknesses. In addition, some of you will be assigned as reviewers for one of these proposals. One week later the entire class will meet to discuss the strengths and weaknesses of each proposal in a study section type meeting. The main objectives of this exercise are to introduce you to the proposal format and the study section "culture," and to provide you with some examples of what makes a good vs. not so good proposal. 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 agrees 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 2: You will submit your F30/31 assignment to the course director and copies of all applications 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 morning 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 agrees 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.

GRADING: There will be no exams. Your grade will be derived from the quality of your participation at the level of the grant that you write, the quality of your written critiques of others' grants, and your ability to explain your thoughts and reasoning during the mock study sections. A breakdown of the grading strategy is provided below.

Proposal writing and workshop participation: 50
Participation in mock study section 1: 25
Participation and critiques for mock study section 2: 25
MAX POSSIBLE TOTAL POINTS 100

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

>95 = A+, 93-95 = A, 90-2 = A-

87-89 = B+, 83-86 = B, 80-82 = B-

77-79 = C+, 73-76 = C, 70-72 = C-

<70 = D

<60 = F

SCHEDULE

	Large group meetings	Workshops	Assignment due
Jan 13 10a-noon*	**Elements of an F30/31**	-	-
Jan 20 10a-noon*	**Principles of Scientific Writing**	>	*Specific aims*
Week of Jan 26	>	**Specific aims**	*[receive grants for review]*
Week of Feb 2	>	>	*Significance + revised Aims*
Week of Feb 9	>	**Significance + Revised Aims**	-
Week of Feb 16	>	>	*Aim 1 Approach + Revisions*
Week of Feb 23	>	**Aim 1 Approach + Revisions**	-
Mar 3 10a-noon*	**Mock study section 1**	-	-
Week of Mar 9	>	>	*Full Research Training Plan*
Week of Mar. 16	>	**Full Research Training Plan**	-
Week of Mar. 23	-	-	-
Week of Mar 30	>	>	*Full Training Plan due to AW*
Week of Apr 6	-	-	-
Apr 14 10a-2p**	**Mock study section 2**	>	*All critiques due to AW*

***room 11-102B, 3600 CCB

**rooms 515 E+W and 516 E+W JMEC

Elements of an F30/31

The portion of the application that you will be writing as part of this course is the **Research Training Project.** Research Training Project portion of an F30/31 is limited to **7 pages** and consists of two main parts: **Specific Aims** and **Strategy**. The Strategy section has two sub-parts: **Scientific Foundation and Rationale** and **Approach**. See pages 55 to 78 of the SF424 Forms for the entire description of the fellowship components of the F30/31 application.

Specific Aims (1 page)

State concisely the broader goals of the proposed research training project (for example, to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a barrier to progress in the field, or develop new technology). List succinctly the specific objectives or aims of the research training project to be completed by the candidate during the funding period. Summarize the expected outcome(s). Include the potential impact that the results of the proposed research training project will have on the research field(s) involved.

The specific aims page should state the problem at hand, its significance, and a description of how you will solve the problem. Avoid the use of jargon in the Aims page. 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. Use an introductory paragraph stating the problem to be addressed and why it is an important problem? Give the big picture. What unique insights or abilities do you have regarding this problem and how will you utilize this unique advantage? What is the overall hypothesis to be tested? This should be stated explicitly in a sentence that guides the entire proposal. 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 brief but specific description of what you will do to accomplish your objectives.

Strategy (6 pages)

Although the fellowship research training project may fall within the larger funded research program of the sponsor(s), the research training project strategy must be written in the candidate's own words. Using language written by others is not allowed in this section because the application is intended to provide information regarding the candidate's understanding of the research training project and ability to communicate the scientific rationale and approaches. Additionally, this section will provide information to evaluate the training potential of the research training project. Candidates may solicit feedback and incorporate suggestions from the sponsor(s) and other scientists into the research training project strategy, but the text must be written by the candidate.

a. Scientific Foundation and Rationale

- Provide the context for the proposed research training project. Include information on published and unpublished findings serving as the scientific foundation for the proposed research training project. Describe the strengths and weaknesses in the rigor of the prior research that serves as the key support for the proposed project.
- Describe the rationale for the research training project, including unaddressed areas for research and why this area of research is interesting and important.
- Describe how achieving the proposed research training project goals will advance biomedical research in the candidate's chosen field.

b. **Approach**

- Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project. Describe plans to address weaknesses in the rigor of the prior research that serves as the key support for the proposed project. Describe the experimental design and methods proposed and how they will achieve robust and unbiased results. Unless addressed separately in the Resource Sharing Plan attachment, include how the data will be collected, analyzed, and interpreted, as well as any resource sharing plans, as appropriate. Resources and tools for rigorous experimental design can be found at the Enhancing Reproducibility through Rigor and Transparency website.
- For trials that randomize groups or deliver interventions to groups, describe how your methods for analysis and sample size are appropriate for your plans for participant assignment and intervention delivery. These methods can include a group- or cluster-randomized trial or an individually randomized group-treatment trial. Additional information is available at the Research Methods Resources webpage.
- Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.
- If the project is in the early stages of development, describe any strategy to establish feasibility, and address the management of any high risk aspects of the proposed work.
- Explain how relevant biological variables, such as sex, are factored into research designs and analyses for studies in vertebrate animals and humans. For example, strong justification from the scientific literature, preliminary data, or other relevant considerations, must be provided for applications proposing to study only one sex. Refer to NIH Guide Notice on Sex as a Biological Variable in NIH-funded Research for additional information.
- Point out any procedures, situations, or materials that may be hazardous to personnel and the precautions to be exercised. If applicable, a full discussion on the use of select agents should appear in the Select Agent Research attachment below.
- If research on Human Embryonic Stem Cells (hESCs) is proposed, but an approved cell line from the NIH hESC Registry cannot be chosen, provide a strong justification for why an appropriate cell line cannot be chosen from the registry at this time.
- If you are proposing to gain clinical trial research experience, briefly describe your role on the clinical trial.

In addition to the **Research Training Project**, there are over 25 additional components that need to be prepared for an actual F31 application, most of which are listed and defined below. You will need to work with your PI and grants administrators to complete most of these other components. See pages 55 to 78 of the SF424 Guidelines for a table outlining all components of an F30/31 application.

All components of the F31 application

1. Introduction to Application (for Resubmission applications)

Candidate Section

2. Candidate's Goals, Preparedness and Potential

Research Training Plan

3. Training, Activities and Timeline

4. Research Training Project Specific Aims

5. Research Training Project Strategy

6. Progress Report Publication List (for Renewal applications)

7. Training in the Responsible Conduct of Research

Commitment to Candidate, Mentoring and Training Environment

8. Sponsor(s) Commitment

9. Letters of Support from Collaborators, Contributors, and Consultants

10. Description of Candidate’s Contribution to Program Goals

Other Research Training Plan Section

Vertebrate Animals

11. Are vertebrate animals euthanized?

12. Vertebrate Animals

13. Select Agent Research

14. Resource Sharing Plan

15. Other Plan(s)

16. Authentication of Key Biological and/or Chemical Resources

Additional Information Section

17. Human Embryonic Stem Cells

18. Alternate Phone Number

19. Degree Sought During Proposed Award

20. Field of Training for Current Proposal

21. Current or Prior Kirschstein-NRSA Support?

22. Applications for Concurrent Support?

23. Citizenship

24. Change of Sponsoring Institution

Budget Section

25. Tuition and Fees
26. Childcare Costs
27. Present Institutional Base Salary
28. Stipends/Salary During First Year of Proposed Fellowship

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 R01 are usually $250,000/year and a given R01 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.

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.

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 14 but at NIAID it was 12. This means that a grant receiving a percentile ranking of 13 would stand a good chance of getting paid by NCI but not by NIAID.

Priority score: A raw number score given to a grant at study section. Scores range from 10 (best possible score) to 50. Typically (these days), scores between 10-17 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 R01'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.

FOA, **Funding opportunity announcement**: the umbrella term for PA, RFA, etc.

R01: Typical 5-year grant proposal.

R03: "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 6-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 discuss a particular grant and put it up for a full score, which the NIH refers to as ‘not discussed - ND’. 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.