Preparing Your NIH Grant Application
Focus on composition

*Training Program in Translational Science*
*October 8, 2013*

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Clinical and Translational Research Institute
UCLA
Module Organization

• Getting funded: Dr. Raffel
• Grant composition
  • The 3 ‘Cs’ of grant writing: Ms. Gellene
  • Resubmission of your A1: Dr. Adams
• The NIH peer-review process: Dr. Adams
• Landscape of other funding opportunities
  • Extramural: Dr. Wang
  • Intramural: Dr. Rome
Overarching Challenge

Present a tremendous amount of information in a limited amount of space.

The three C’s: clear, complete, convincing
Presentation Outline

• **Organization:** Develop an **outline**

• **Writing:** Focus on **specific aims**

• **Editing:** Strive for **clarity**

• **Rewriting:** Be **concise**
Organization
Getting Started

Understand what grant-making entity wants to know

– Read **RFA**
– Note **review criteria**
  • Special review criteria, if any
  • Key phrases
Basic Structure

- Specific Aims
  - 1 page

- Research Strategy
  - 6 or 12 pages
Standard Review Criteria

Significance: Why is this important? Who cares?

Innovation: What is special about what you plan to do?

Investigators: Can you pull this off?

Approach: How do you plan to do this?

Environment: Can you do it here?
Typical Outline

• **Specific Aims**

• **Significance**

• **Innovation**

• **Approach**
  o Investigators
  o Preliminary Data
  o Methods to Achieve Aims
    – Organize by Aims
  o Pitfalls and alternatives
  o Timeline
A. Overview of the Proposed Center (12 pages)

Provide the overall objectives of the Center, including the short- and long-term goals. Describe how the Center's expertise, capabilities, partnerships, and resources will enable it to have a significant influence on accelerating the pace and increasing the probability of success for discoveries and innovations being developed into commercial products. Provide a detailed description of the Center’s leadership team.

Describe the criteria used to select the partners and the qualities and strengths that each Partner brings to the Center. Describe how the Center will facilitate and promote interaction with existing institutional and government programs.

The application should include a plan for transition of the Center to a self-sustainable architecture.
Outline with Expanded Review Criteria

• **Short- & Long-term Goals**
  – Long-term Goal: Sustainability

• **Significance**

• **Innovation**

• **Leadership**
  – Expertise & Capabilities

• **Partnerships**
  – Expertise, Capabilities and Resources they bring

• **Interactions with Existing Entities**
  – Capabilities and Resources they bring

• **Approach: Methods to Achieve the Goals**
  – Includes sustainability plan
C. APPROACH

C.1. AIM 1: DEFINE THE STRUCTURAL VARIATION IN PARVOVIRUS CAPSIDS

C.1.1. Brief summary of the literature and preliminary results

C.1.1.1. Functional variation and flexibility of parvoviral protein structures
Outline Tips

• Be consistent

• Avoid going beyond four places
  – A.1.1.1.

• Use headings to help make your argument
Writing
Specific Aims

• Do the aims address **interesting** and **significant** issues?

• Are they **hypothesis-based**?

• Are they "**win-win**" — will an outcome consistent with the null hypothesis still be a contribution to the field?
Specific Aims Example

Aim 1: Develop algorithms for C. elegans viability assays to identify modulators of pathogen infection

Aim 2: Develop algorithms for C. elegans lipid assays to identify genes that regulate fat metabolism

Aim 3: Develop algorithms for gene expression pattern assays to identify regulators of the response of the C. elegans host to Staphylococcus aureus infection

Aims are related, but not dependent
Each aim is a concrete objective
Specific Aims

Microscopy has emerged as one of the most powerful and informative ways to analyze cell-based high-throughput screening (HTS) samples in experiments designed to uncover novel drugs and drug targets. However, many diseases and biological pathways can be better studied in whole animals—particularly diseases that involve organ systems and multicellular interactions, such as metabolism and infection. The worm Caenorhabditis elegans is a well-established and effective model organism that can be robotically prepared and imaged, but existing image-analysis methods are insufficient for most assays.

We propose to develop algorithms for the analysis of high-throughput C. elegans images, validating them in three specific experiments to identify chemicals to cure human infections and genetic regulators of host response to pathogens and fat metabolism. Novel computational tools for automated image analysis of C. elegans assays will make whole-animal screening possible for a variety of biological questions not approachable by cell-based assays. Building on our expertise in developing image processing and machine learning algorithms for high-throughput screening, and on our established collaborations with leaders in C. elegans research, we will:

**Aim 1:** Develop algorithms for C. elegans viability assays to identify modulators of pathogen infection

**Challenge:** To identify individual worms in thousands of two-dimensional brightfield images of worm populations infected by Microsporidia, and measure viability based on worm body shape (live worms are curvy whereas dead worms are straight).

**Approach:** We will develop algorithms that use a probabilistic shape model of C. elegans learned from examples, enabling segmentation and body shape measurements even when worms touch or cross.

**Impact:** These algorithms will quantify a wide range of phenotypic descriptors detectable in individual worms, including body morphology as well as subtle variations in reporter signal levels.

**Aim 2:** Develop algorithms for C. elegans lipid assays to identify genes that regulate fat metabolism

**Challenge:** To detect worms versus background, despite artifacts from sample preparation, and detect subtle phenotypes of worm populations.

**Approach:** We will improve well edge detection, illumination correction, and detection of artifacts (e.g. bubbles and aggregates of bacteria) and enable image segmentation in highly variable image backgrounds using level-set segmentation. We will also design feature descriptors that can capture worm population phenotypes.

**Impact:** These algorithms will provide detection for a variety of phenotypes in worm populations. They will also improve data quality in other assays, such as those in Aims 1 and 3.

**Aim 3:** Develop algorithms for gene expression pattern assays to identify regulators of the response of the C. elegans host to Staphylococcus aureus infection

**Challenge:** To map each worm to a reference and quantify changes in fluorescence localization patterns.

**Approach:** We will develop worm mapping algorithms and combine them with anatomical maps to extract atlas-based measurements of staining patterns and localization. We will then use machine learning to distinguish morphological phenotypes of interest based on the extracted features.

**Impact:** These algorithms will enable addressing a variety of biological questions by measuring complex morphologies within individual worms.

In addition to discovering novel anti-infectives and genes involved in metabolism and pathogen resistance, this work will provide the C. elegans community with (a) a versatile, modular, open-source toolbox of algorithms readily usable by biologists to quantify a wide range of important high-throughput whole-organism assays, (b) a new framework for extracting morphological features from C. elegans populations for quantitative analysis of this organism, and (c) the capability to discover disease-related pathways, chemical probes, and drug targets in high-throughput screens relevant to a variety of diseases.
Specific Aims Narrative

• Summarize knowledge/ current state
• Identify knowledge gap/need
• Identify problem associated with gap/need
• Introduce project to address gap
• Identify long-range goals
• Introduce qualifications of team
• Conclusion
  -- emphasize significance and goals
Microscopy has emerged as one of the most powerful and informative ways to analyze cell-based, high-throughput screening samples in experiments designed to uncover novel drugs and targets. (1) However, many diseases and biological pathways can be better studied in whole animals—particularly diseases that involve organ systems and multicellular interactions, such as metabolism and infection. (2) The worm *C. elegans* is a well-established and effective model organism that can be robotically prepared and imaged, but existing image-analysis methods are insufficient for most assays. (3)

1) Summarizes knowledge
2) States a need
3) Identifies a problem to be solved

Source: NIAID
Specific Aims Narrative

- Summarize knowledge
- Identify knowledge gap/need
- Identify problem associated with gap/need
  - Introduce project to address gap
  - Identify long-range goals
  - Introduce qualifications of team
- Conclusion
  -- emphasize significance and goals
We propose to develop algorithms for the analysis of high-throughput *C. elegans* images, validating them in three specific experiments to identify chemicals to cure human infections and genetic regulations of host response to pathogens and fat metabolism.

Novel computational tools for automated image analysis of *C. elegans* assays will make whole-animal screening possible for a variety of biological questions not approachable by cell-based assays.

Building on our expertise in developing image processing and machine learning algorithms for high-throughput screening, and on our established collaborations with leaders in *C. elegans* research, we will carry out the following aims:

Source: NIAID
We propose to develop algorithms for the analysis of high-throughput *C. elegans* images, validating them in three specific experiments to identify chemicals to cure human infections and genetic regulations of host response to pathogens and fat metabolism. (1) Novel computational tools for automated image analysis of *C. elegans* assays will make whole-animal screening possible for a variety of biological questions not approachable by cell-based assays. (2) Building on our expertise in developing image processing and machine learning algorithms for high-throughput screening, and on our established collaborations with leaders in *C. elegans* research, (3) we will carry out the following aims:

1) Project designed to address gap
2) Long-range goal
3) Introduce qualifications of team
Specific Aims Narrative

✓ Summarize knowledge
✓ Identify knowledge gap/need
✓ Identify problem associated with gap/need
✓ Introduce project to address gap
✓ Identify long-range goals
✓ Introduce qualifications of team

• Conclusion
  -- emphasize significance and goals
In addition to discovering novel anti-infectives and genes involved in metabolism and pathogen resistance, this work will provide the *C. elegans* community with (a) a versatile, modular, open-source toolbox of algorithms readily usable by biologists to quantify a wide range of important high-throughput whole-organism assays, (b) a new framework for enhancing morphological features from *C. elegans* populations for quantitative analysis of this organism, and (c) the capability to discover disease-related pathways, chemical probes, and drug targets in high-throughput screens relevant to a variety of diseases.

Source: NIAID
In addition to discovering novel anti-infectives and genes involved in metabolism and pathogen resistance, (1) this work will provide the C. elegans community with (a) a versatile, modular, open-source toolbox of algorithms readily usable by biologists to quantify a wide range of important high-throughput whole-organism assays, (b) a new framework for enhancing morphological features from C. elegans populations for quantitative analysis of this organism, and (c) the capability to discover disease-related pathways, chemical probes, and drug targets in high-throughput screens relevant to a variety of diseases. (2)

1) Goals
2) Significance

Source: NIAID
Specific Aims Page Outline

Introductory paragraph
- Summarize knowledge
- Identify gap/need
- Identify problem associated with gap/need

Second paragraph
- Introduce project designed to address gap
- Identify long-range goal
- Introduce qualifications of team

Specific Aims
- Purpose, rationale and outcome for each aim

Conclusion
- Emphasize significance and goals
Aim 1: Develop algorithms for *C. elegans* viability assays to identify modulators of pathogen infection

**Challenge:** To identify individual worms in thousands of two-dimensional brightfield images of worm populations infected by Microsporidia, and measure viability based on worm body shape (live worms are curvy whereas dead worms are straight) **What they plan to do**

**Approach:** We will develop algorithms that use a probalistic shape model of *C. elegans* learned from examples, enabling segmentation and body shape measurements even when worms touch or cross. **How and why they plan to do it**

**Impact:** These algorithms will quantify a wide range of phenotypic descriptors detectable in individual worms, including body morphology as well as subtle variation in reporter signal levels. **Outcome**

Source: NIAID
Editing
Clarity: Antecedent Problem

Ambiguous
My sandwich was in my lunchbox, but now it’s gone.

Clear
My sandwich was in my lunchbox, but now my sandwich is gone.

Ambiguous
The lab has tissue samples from 20 women frozen in a tank.

Clear
The lab has tissue samples from 20 women. The samples are frozen in a tank.
Be Positive

Avoid “iffy” language
• **Bad:** hope, hopefully, with luck, if possible
• **Good:** expect, anticipate, predict, forecast

Avoid negative language
• **Bad:** could not complete, did not work
• **Good:** made steady progress, improved our approach
Voice

Example #1

It has been found by me! (Passive; 6 words)

I have found it! (Active; 4 words)

Example #2

Analyses for the effects reported in this study are of two kinds. (Passive; 12 words)

We can analyze our results in one of two ways. (Active; 10 words)
Alphabet Soup

Keep abbreviations to a minimum

**CTSI**, a research partnership of **UCLA, CSMC, CDU** and **LA Biomed**, is funding pilots with **LAC DHS** and **LAC DPH**.

**NLRs**, analogous to **TLRs**, contain **LRRs** for sensing **PAMPs**.
Parallel Structure

**Before**

Formerly, science was taught by the textbook method, while now **the laboratory method is employed**.

**After**

Formerly, science was taught by the textbook method; now **science is taught by the laboratory method**.
Commas and Semi-colons

Separate words, phrases or clauses in a series with commas

Please record subjects’ age, race or ethnicity, gender, and blood pressure.

Semi-colons bring order to lists that contain commas

Study sites are Olive View, a county hospital; UCLA; Methodist, a community hospital; and USC.

Avoids ambiguity
The Dash

Amplify a thought in a sentence

Los Angeles is the largest county in the U.S.—it is larger than 42 states.

Set off parenthetical phrase

Young adults ages 18–24—a group known as “Young Invincibles”—face a high risk of motor vehicle fatalities.

Makes sentence easier to read
Hyphens

Hyphens are connectors
  • List your long- and short-term goals.
  • Team-based approach

Hyphens affect meaning
  • Spanish-language interpreter vs. Spanish language interpreter

No hyphen with words that end in -ly
  • Publicly traded company
Odds & Ends

No apostrophe for plural numbers & abbreviations
• I’ve been working on this problem since the early 1970s.
• These courses are for MDs.

Apostrophes indicate possession
• The MD’s notebook is on the counter.

Commas in dates
• May 10, 2013 (comma between day and year)
• May 2013 (no day, no comma)

Place commas inside quotes
• “I have found it,” he said.
Rewriting
Either the congener (1) themselves have direct and permanent effects upon the central nervous system, or there (1) may be a retardation of the metabolism of ethanol by the congener (2) so that it (3) has a stronger effect.

Joseph Williams, Columbia University lecture, 2008
Either the *congeners* (1) themselves have direct and permanent effects upon the central nervous system, or *there* (1) may be a retardation of the metabolism of ethanol *by the congeners* (2) so that *it* (3) has a stronger effect.

(1) No parallel structure
(2) Passive voice
(3) Ambiguous antecedent
Either the congeners themselves have directly and permanently affect effects upon the central nervous system, or there may be a retardation of the metabolism of the congeners (1) cause the body (2) to metabolize ethanol more slowly by the congeners so that the ethanol (3) has a stronger effect affects the nervous system more strongly.

(1) Establish parallel structure
(2) Change to active voice
(3) Antecedent is clear

Joseph Williams, Columbia University lecture, 2008
Either the **congeners** themselves directly and permanently affect the central nervous system, or **the congeners** (1) **cause** (2) the body to metabolize ethanol more slowly so that the **ethanol** (3) affects the nervous system more strongly.

(1) **Parallel structure**  
(2) **Active voice**  
(3) **Clear antecedent**
Omit Needless Words*

**Before**

In the event that we envision only positive future selves, we may not accurately gauge our chances at success, or properly prepare ourselves for obstacles. *(25 words)*

**If in the event that we envision only positive future selves, we may **inflate** not accurately gauge our chances for at success, or and fail to properly prepare ourselves for obstacles.**

**After**

If we envision only positive future selves, we may inflate our chances for success and fail to prepare for obstacles. *(20)*

* William Strunk Jr.
There is growing evidence to suggest that there are unique risk factors that are unique to truants. *(17 words)*
There is growing evidence to suggest that there are unique risk factors that are unique to truants. (17 words)

Growing evidence suggests truants face unique risk factors. (8 words)
Emphasis & Readability

• Use bold, italics and underlining

• Use white space

• Use graphics
Effective Grant Writing

• Clear: Your writing conveys exactly what you mean to reviewers

• Complete: Your writing completely expresses your idea and responds to the RFA

• Convincing: Your writing excites reviewers about the value of your proposal
Sample Grants

For Your Bookshelf

• “Eats, Shoots & Leaves” by Lynne Truss
  – Punctuation

• “On Writing Well” by William Zinsser
  – General writing advice

• “Elements of Style” by William Strunk and E.B. White
  – Grammar and usage

• “10 Lessons in Clarity and Grace” by Joseph Williams
  – Sentence construction

• Chicago Manual of Style
  – Authoritative technical guide

• Purdue Owl
  – Online grammar, punctuation and usage guide
The Goal

MALLARD FILLMORE/ by Bruce Tinsley

LIKE I ALWAYS SAY, SON...

“GIVE SOMEBODY A GRANT, AND YOU FEED HIM FOR A DAY…”

“...TEACH HIM TO FILL OUT GRANT APPLICATIONS, AND YOU FEED HIM FOR LIFE…”

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The Current Timelines
“What to expect and when to expect it”

**Months**

- Submission to OER
- CSR gives SRG, I/C and PD assignment
- SRG review
- Score
- Summary statement
- Council
- Resubmission
- Revision
Summary Statement

• Available 4-8 weeks post study section in your eRA Commons account
• “not discussed” and new investigator applications processed first
• Available only to:
  – PI of program director of the grant
  – NIH officials
  – Council members
Summary Statement Contents

• First page
  – Program officer (name and contact info)
  – Final impact/priority score or ND
  – Percentile rank if applicable
  – Budget request

• Subsequent pages
  – Description (applicant’s abstract)
  – Resume (if discussed)
  – Individual critiques (unedited) in bullet format
  – Administrative notes; budget, human subjects, etc
  – Study Section roster
**PROJECT TITLE:** Mechanism of retinoic acid receptor induced innate immune responses

**SRG Action:** Impact/Priority Score: 20

**Human Subjects:** 30-Human subjects involved - Certified, no SRG concerns
**Animal Subjects:** 10-No live vertebrate animals involved for competing appl.
**Gender:** 1A-Both genders, scientifically acceptable
**Minority:** 1A-Minorities and non-minorities, scientifically acceptable
**Children:** 3A-No children included, scientifically acceptable
**Clinical Research - not NIH-defined Phase III Trial**

<table>
<thead>
<tr>
<th>Year</th>
<th>Direct Costs Requested</th>
<th>Estimated Total Cost</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>150,000</td>
<td>162,000</td>
</tr>
<tr>
<td>2</td>
<td>100,000</td>
<td>108,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>250,000</strong></td>
<td><strong>270,000</strong></td>
</tr>
</tbody>
</table>

**ADMINISTRATIVE BUDGET NOTE:** The budget shown is the requested budget and has not been adjusted to reflect any recommendations made by reviewers. If an award is planned, the costs will be calculated by Institute grants management staff based on the recommendations outlined below in the COMMITTEE BUDGET RECOMMENDATIONS section.

**NOTE TO APPLICANT:** A new scoring system is in use for NIH grant applications [(<http://grants.nih.gov/grants/guide/notice-files/NOT-OD-09-024.html>)] and [(<http://grants.nih.gov/grants/guide/notice-files/NOT-OD-09-025.html>)]. The new system requires new percentile bases. Some of the new percentile bases will not be calculated until June 22, 2009. If your application is eligible for percentiling, but no percentile is currently shown, that percentile will be available in the eRA Commons after June 22, 2009.
Summary Statement Contents

• First page
  – Program officer (name and contact info)
  – Final impact/priority score or ND
  – Percentile rank if applicable
  – Budget request

• Subsequent pages
  – Description (applicant’s abstract)
  – Resume (if discussed)
  – Individual critiques (unedited) in bullet format
  – Administrative notes; budget, human subjects, etc
  – Study Section roster
Resubmissions

• Due in March, July or November for R grants
• Uses the SF424 format
  – Contains *clearly* marked revisions to the original submission
• Introduction or Section 1
  – Limited to 1 page for all R and most K grants
  – Delineates substance and sites of revisions
Adams Method for “Pink Sheet” Analysis

• Tabulate strengths (black) and weaknesses (red).
  – Be comprehensive, but
  – Mark but don’t count the same criticism twice
  – Black:red ratios
    • >1:1; score ≤20
    • ~1:2; score ≤30
    • ~1:3; score ≤40
    • <1:4; score ≤50
    • <1:5; unscored
• Most important criticisms are those levied by more than a single reviewer.
NEW INVESTIGATOR

RESUME AND SUMMARY OF DISCUSSION: Particularly, currently at University of California, Los Angeles, CA submitted this outstanding Research Scholar Development Award (K22) entitled “Mechanism of Retinoic Acid Receptor Induced Innate Immune Responses”. The applicant proposes to study the regulation and function of the vitamin D-mediated host defense and the role of retinoic acid and toll-like receptors (TLRs) in the innate immune response against intracellular Mycobacteria. The principal strengths of the application noted included: 1) outstanding candidate; the candidate possesses an excellent publication record and research product; 2) strong and clearly written research plan; 3) significance of the proposed study; 4) strong letters of reference; an overall excellent career development plan. The committee expressed enthusiasm for the candidate, who demonstrated potential to develop into an independent researcher. Weaknesses discussed included: 1) paucity of human samples to be analyzed, which could lead to misinterpretation of the results; 2) concerns about the applicant’s independence since he has been in his current environment for a long time; 3) lack of clarity in what elements of the project he can develop into an R01 grant application; whether the candidate’s project is independent of his mentors’ projects; and whether he can move to another institution with the project. The review committee recommended support of this application for two years.

DESCRIPTION (provided by applicant): Previous studies have demonstrated that activation of the RAR results in antimicrobial activity against intracellular Mycobacterium tuberculosis. Our preliminary data suggest that this antimicrobial activity could be mediated through activation of the vitamin D metabolic system. In addition, our data indicate that concurrent TLR and RAR activation results in amplification of both macrophage differentiation and increase in the antimicrobial response. These data suggest an important role of RAR in the innate immune response and is suggestive of a potential mechanism by which vitamin A deficiency is correlated to increased susceptibility to disease in humans. The data generated from this study should provide new avenues of research into the host defense mechanisms against M. tuberculosis, as well as potential therapeutic targets. This application is submitted by Dr. Philip T. Liu, an investigator in the field of immunology whose objective is to transition into an independent researcher. As part of his career development, he will receive training in translational immunology and molecular endocrinology through co-mentorship by Dr. Robert L. Modlin and Dr. John S. Adams. Also, Dr. Genhong Cheng and Dr. Martin Hewison will provide additional mentorship in their respective fields of expertise. This proposal also outlines the course work through the K30 program at UCLA that will help Dr. Liu increase his knowledge base and improve his ability to execute translational clinical research. In the interim, Dr. Liu will be provided research space and resources with Dr. Modlin's laboratory at the University of California at Los Angeles where Dr. Liu will have all the necessary resources to successfully complete his training. In summary, this application will serve not only to address immediate and long term scientific questions, but also the career development of Dr. Liu into a successful independent researcher.
CRITIQUE 1:

Criterion Scores Table

Candidate: 1
Career Development Plan/Career Goals & Objectives: 1
Research Plan: 1
Mentor(s), Consultant(s), Collaborator(s): 1
Environment and Institutional Commitment to the Candidate:

Overall Impact:

Strengths

1. Dr. Liu is an outstanding candidate for this award.
2. Strong research productivity and letters of reference.
5. Career development program for this candidate appears to be excellent.
6. Research plan is clearly written, and it appears to be well within the candidate’s expertise and experience.
3. The area of study is highly significant, focusing on the role of vitamin D and innate immunity against \textit{M. tuberculosis}.

Weaknesses

- No weaknesses are noted.

1. Candidate:

Strengths

- Dr. Liu is an outstanding candidate.
- The candidate has potential to become a successful independent investigator. This is supported by a strong publication record with papers in the \textit{Journal of Immunology} and \textit{Science} that are related to the area of the proposed work.
- The candidate is an author on 18 research publications and six review articles. He is first-author on five of the research articles and one review article. Since 2007, 19 manuscripts were published or in press, and three are as a first-author in the \textit{Journal of Immunology}. Thus, the candidate is productive, and his work is published in peer-reviewed, high-quality journals.
- The reference letters are very good. The candidate’s letters are highly complimentary, and suggest the making of a strong independent scientist.
Weaknesses

A minor weakness is that the candidate has done both Ph.D. and post-doctoral work in the same laboratory. However, he has made an effort to broaden interactions with other scientists, which minimizes the potential for a narrow training experience.

2. Career Development Plan/Career Goals & Objectives/Plan to Provide Mentoring:

Strengths

6 The career development program for this candidate appears to be excellent. It has included needed coursework and participation in a K30 program to provide a more interdisciplinary training to investigators with an emphasis on translation research, etc.

8 The group of scientists that has advised this candidate is excellent and composed of researchers whose expertise complement the candidate’s expertise for the proposed research.

Weaknesses

- No weaknesses are noted.

3. Research Plan:

Strengths

4 The area of study is highly significant, focusing on the role of vitamin D and innate immunity against *M. tuberculosis*.

3 The research plan is clearly written, and it provides needed details that demonstrate the feasibility of the approaches proposed.

7 The research project is focused and appropriate for this candidate’s stage of research development, and the project will likely provide a foundation for a future productive independent research career.

7 The research plan will provide the candidate an opportunity to pursue his career objectives.

Weaknesses

- No weaknesses are noted.

4. Mentor(s), Consultant(s), Collaborator(s):

Strengths

9 The mentors are outstanding.

Weaknesses

- No weaknesses are noted.
Adams Method for “Pink Sheet” Analysis

- Tabulate strengths (black) and weaknesses (red).
  - Be comprehensive, but
  - Mark but don’t count the same criticism twice
  - Black:red ratios
    - ~2:1; score ≤20  ratio: 20:10  score: 20
    - ~1:1; score ≤30
    - ~1:2; score ≤40
    - <1:3; score ≤50
    - <1:4; unscored
- Most important criticisms are those levied by more than a single reviewer.
Worth of “Pink Sheet” Analysis

• Will objectify the rationale for your score
• Provides a comprehensive “roadmap for response” in the ‘Introduction’
• Prevents you from missing individual points of critique that must be addressed in the resubmission
Writing the Introduction

- Thank the SRG for their work
- Begin on a positive note
  – Briefly “recount” the strengths noted by the SRG
- “Recount” each weakness
  – Start with most frequently noted and substantial
  – Move to least common and serious
  – Identify the site of revisions in response to stated weaknesses
- End on a positive note
Your Resubmission

**Do:**

- follow SF424 instructions precisely
- assume *all* of the initial study section comments were correct (or mostly correct).
- respond to *all* criticisms.
- Assume the same reviewer(s) will be seeing your revised application.
  - try to identify “your reviewer(s)” from the summary statement roster
  - write the resubmission with your reviewers’ research/expertise in mind
Your Resubmission

**Do Not:**

- assume you’re smarter than your reviewers
- argue with the reviewers in your response
- leave out a consideration of any criticism, regardless of how “minor” it might seem to you
- fail to have your colleague and/or mentor review your revision before resubmission
- fight with your:
  - grants and contract officer
  - IRB office
  - IACUC representative
Your Resubmission

**Fatal Flaws**

- Not marking points of revision in your resubmission
- Writing a “non-responsive” Introduction
- Writing an antagonistic (i.e. condescending) Introduction
- Resubmitting before you have the additional preliminary data requested
Ten Commandments

For Writing Research
Strategy Sections
I. Thou shall have a testable hypothesis in a “hot” area

II. Thou shall have short and concise specific aims

III. Thou shall be an expert in the literature of your topic

IV. Thou shall not “cut-and paste”

I. Thou shall acknowledge pitfalls and alternative plans

VI. Thou shall use pictures to tell your story

VII. Thou shall provide a reasonable timeline

VIII. Thou shall have “zero tolerance” for errors

IX. Thou shall put yourself in the shoes of the reviewer

X. Thou shall use your grant writing mentor or advisor(s)
“One Picture Can Be Worth a Thousand Words”
I. Thou shall have a testable hypothesis in a “hot” area

II. Thou shall have short and concise specific aims

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