Preparing Successful Proposals for the NSF Directorate of Biological Sciences

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Today’s Plan

• **Morning** – Focus on the Summary Page
  – Hypothesis
  – Specific Aims – Intellectual Merit

• **Lunchtime** – Optional session with NSF Program Director Dr. Susanne von Bodeman

• **Afternoon** – Other parts of an NSF proposal
  – Broader Impacts
  – Biosketch, Data Management Plan, Postdoc mentoring plan
  – RUI Impact Statement
Grant Proposal Guide (GPG)

a. Cover Sheet
b. Project Summary
c. Table of Contents
d. Project Description
e. References Cited
f. Biographical Sketch(es)
g. Budget and Budget Justification
h. Current and Pending Support
i. Facilities, Equipment and Other Resources
j. Special Information and Supplementary Documentation
   • Data Management Plan
   • Postdoctoral Mentoring Plan (if applicable)
   • Letters of support (if applicable)
Grant Proposal Guide (GPG)

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HYPOTHESIS DEVELOPMENT

45 MINUTES
Hypothesis Development

• Broad area of interest
  – Paint an interesting picture of your topic
  – Keep it simple: NY Times or USA Today?

• Maybe harder for education grant proposal
  – Present it in the best way you can
  – Try not to shoe horn your idea into a hypothesis 😊
Translating the four-letter code of RNA into the twenty-two-letter alphabet of proteins is a central feature of cellular life. The accuracy of this process, translation of the genetic code, determines how faithfully the information in a genome is transformed into proteins with correct amino acid sequences.
Hypothesis Development

• Funnel
  – Start to focus on specific areas
  – Goal: the reader should find your hypothesis a logical extension of the preamble
The simplicity of amino acid structures makes discrimination between them difficult.

Aminoacyl-tRNA synthetases achieve the amino acid substrate specificity necessary to keep errors in translation to an acceptable level in two ways: preferential binding of the cognate amino acid, and selective editing of non-cognate amino acids.
Editing significantly decreases the frequency of mistakes during aminoacyl-tRNA synthesis in vitro, although many details of the reaction mechanism and the impact of in vivo editing remain unclear.
Hypothesis Development

• Hypothesis drivers
  – What are the “known unknowns”?
  – What is your aim?
  – How will you answer the questions?
  – Neither too broad or too narrow (Goldilocks)
Spell it out!

- The broader questions addressed by this proposal are: what role does editing play that has caused it to be so highly conserved through evolution, and how do different conditions change cellular requirements for translational accuracy?

- The objectives of this proposal are to determine the molecular mechanisms of editing by PheRS, and utilize this information to.....
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SPECIFIC AIMS

1 HOUR
Specific Aims

• Aim for Transformative
• Not too broad or too specific (Goldilocks again!
• Your aims should run through the time of the proposed grant
• Try to make them concise
• Each aim should ideally be independent of the others
• Together they should achieve the big goal
• Should logically flow from your preliminary data
• Avoid fishing expeditions (!!!)
Specific Aims

• Overarching Goal (Image)
  – Specific Aim 1
    • Objectives, Targets, Measurements
  – Specific Aim 2
    • Objectives, Targets, Measurements
  – Specific Aim 3
    • Objectives, Targets, Measurements
    • Aim 3 should be as important as Aim 1
Example Specific Aims

- Yellow highlight - Sets up the tension or the “plot”

- Blue Highlights – specific aims stated followed by *brief* rationale and approach
This Afternoon’s Plan

Broader Impacts – 45 minutes
Biosketch – Mike – 15 minutes
Data Management Plan – Jo – 10 minutes
Postdoc Mentoring Plan – Jo – 10 minutes
RUI Impact Statement – Jo – 30 minutes
OR
Breakout session with Mike
BROADER IMPACTS

Gita – Community College
Jo - PUI
Mike – Research University
Broader Impacts – Community College

• Focus on how this impacts the education of students who are currently NOT getting this experience
• Connect to workforce/industry requirements
• Good to show industry partners (support letters) – Required for ATE grants
Broader Impacts – Community College

• If you have a BI-focused aim – provide specifics of how you would accomplish that

We plan to increase the number of minority students by partnering with xx organization who will help us recruit yy number of students (attach support letter)

• Regional Impact of your work (e.g. bringing new technology or opportunities to a rural area)
Broader Impacts - PUI

• Consider integrating past & future student accomplishments into the text of your project description
• Consider developing a BI-focused Specific Aim
• Discuss broader impacts that would result only by funding this research

Avoid describing more of the same!
Integrating past & future student accomplishments into the text of your project description

• Preliminary results – Mention student by name who performed a specific experiment

• Experimental Plan- should include each Specific Aim with subsections such as
  – Rationale
  – Method OR Approach
  – Expected Outcome and Potential Pitfalls

*Consider adding “Broader Impact” to this list*
Develop a Broader Impact-focused Specific Aim

• Integrate a component of your proposed research into a course
• Integrate a component of your proposed research into a citizen science project
Broader impacts that would result only by funding this research

• Equipment used by others in the department for instructional and/or research purposes

• An outreach project that requires funding such as summer HS students and/or teachers
Broader Impacts – Research University

- As for the PUI, but different balance while still *integrated* with your research
- Find out what your school does already
- Become active outside your lab
- Be specific, measure outcomes

- Make sure your BI section does not look like an afterthought!
Evaluation

• Identify external Evaluation Consultant early!
• Have them involved in writing the proposal
  – He/she will provide a rough evaluation plan
  – Include summary of the plan in the narrative
  – Can include full plan as an Appendix
  – Should not cost you money
• They will work with your internal assessment person
BIOSKETCH

• Focus on what is relevant to the proposal
• Two page limit; See pages II-11 & II-12 of the GPG
• Identify collaborators
• What are synergistic activities?
  – Your chance to show the reviewer more than just a CV!
  – Curriculum development
  – Method/website development
  – Outreach activities
  – Editorial/reviewing responsibilities
  – Advising responsibilities (if they are significant)
  – Special appointments
Data Management Plan

• 2-page limit
• Describe how the PI(s) will manage and disseminate data generated by the project
  – Includes both original and metadata (protocols, statistical methods, etc), software and code
• See pages II-21 & II-22 of the GPG and the Updated Information from the Directorate of Biological Sciences
• Example organization approaches provided
• There are some nice templates available online
Postdoc Mentoring Plan

• 1-page limit
• career counseling
• training in preparation of grant proposals, publications and presentations
• guidance on ways to improve teaching and mentoring skills
• guidance on how to effectively collaborate with researchers from diverse backgrounds and disciplinary areas
• training in responsible professional practices
Postdoc mentoring plan
Example organization

• Research Proficiency
  – Instruction on the ethical conduct of research

• Communication of Research
  – Manuscript Preparation
  – Grant Proposal Preparation
  – Oral Presentations

• Teaching and Mentoring (includes outreach)

• Career Counseling

• Formal Evaluation of Progress
RUI Proposals

• Your proposal title must be prefixed with “RUI:…”
• Apart from the Certification of RUI Eligibility and RUI Impact Statement, your proposal is constructed the same as any other proposal for that solicitation/program
• The RUI Eligibility and RUI Impact Statement are not included in your PD (i.e., they are not part of your 15-page limit)
RUI Impact Statement

• 5-page limit
• How will funding impact research at your institution and your lab?
• How well equipped is your lab/department/institution to prepare undergrads for postgraduate work and/or STEM career?
RUI Impact Statement

• Start by describing your institution (public, private, total no. students, etc) and then your department. Include demographics of faculty and students. What is the teaching load?

• Discuss department (and personal) track record of training students: where have your students gone post graduation? Does your department have a record of undergrads co-authoring papers?

• How will students be recruited for this study?

• How will this funding impact your department?

• What institutional support will be provided should you receive funding?
RUI Impact Statement
Example Organization

• General Information: Frostbite Falls University
  – Public/private, number of students and faculty, m% minority

• Department of Biology
  – Number of faculty (tenured, untenured)
  – Number of majors, minors. % women and minorities

• Role of Undergraduate Student Research
  – From POV of Institution, Department, YOUR LAB

• Impact of Proposed Research on Undergraduate Education
  – From POV of Institution, Department, YOUR LAB
Certificate of RUI Eligibility

- Should be on file with your SRO
- If it is not: He/She needs to generate it for you
Thank you and Good Luck!!!