

A Successful NSF Grant Proposal Structure

There are many ways to write an excellent biology research proposal. However, variants of this structure were very successful in a recent NSF panel.

This highly repetitive approach ensures that your reviewers understand what you are proposing to do and, just as importantly, *why* you are doing it. The reader is introduced to your specific aims 3 times, each time with more methodological detail. You should include enough methods and preliminary data to give your reviewers confidence that you know what you are doing on a technical level. But the real purpose of a proposal is to generate excitement about the importance of your biological question and to convince reviewers that you have identified experimentally tractable, testable hypotheses. Technical weaknesses can doom a proposal, but technical strength alone is not enough to get it funded. At least one person on the panel has to fall in love with your project!

Summary (on separate 1-page form)

- a. Overview (motivation & hypotheses)
- b. Intellectual Merit (why this will generate important scientific results)
- c. Broader Impacts (should clearly go beyond teaching & mentoring grad & undergrad students at your own institution)

Proposal Body (15 page limit)

I. Conceptual Framework & Specific Aims (~2-3 pages)

Should include a paragraph beginning: “The overarching goal of this proposal is to test the hypothesis that ...” followed by a list of Specific Aims

Each Specific Aim should be followed by a 1-2 sentence summary of the relevant sub-hypotheses and their experimental approaches.

This section should end with 1-2 paragraphs explaining the needs that will be met by both the scientific & the broader impacts portions of the project. Use this opportunity to summarize your Broader Impacts project(s) and showcase how your scientific research is tightly integrated with your Broader Impacts.

II. Rationale and Significance (~1 page)

2-3 paragraphs summarizing existing data and motivation for the proposed research; highlight strengths of your experimental system

III. Overview of Research Plan (~1-1.5 pages, 3-4 paragraphs)

Begin “Here we address the over-arching hypothesis that”

Summarize briefly what will be done for each Specific Aim. (“In Aim 1 we will build on successful preliminary experiments to...” In Aim 2 we will systematically catalogue, for the first time, ...” In Aim 3 we will use [technique] to evaluate the relative importance of...”) End with synthesis and justification, e.g.: “The experiments proposed here will illuminate several

fundamental aspects of ...” “The particular power of this experimental approach is ...” “These combined characteristics enable powerful tests of hypotheses to unify understanding of ...”)

IV. Experimental Design

Repeat this structure for each Aim

- a. Specific Aim X (restate aim)
- b. Background, preliminary data and predictions.
- c. State overall goal of Aim 1
- d. Summarize experimental approach
- e. Aim X Methods
- f. Predicted Outcomes
- g. Potential Pitfalls and Alternative Approaches (use this only if you see obvious pitfalls that need to be addressed)

V. Timeline for Proposed Research (0.5 pages)

Can be text or table. If collaboration is involved, use color or other coding to identify who will do what

VI. Broader Impacts (1-1.5 pages)

Summarize briefly the proposed work, concluding paragraph with sentences beginning: “Our work will contribute to **science** by ...” and “Our work will contribute to **society** by ...”

Strong Broader Impacts sections feature:

- one or at most two well-developed projects, products, or activities
- a novel outreach/teaching idea, often involving a collaborator with relevant teaching/outreach expertise
- a strong connection/integration with the scientific project
- support in the grant budget (e.g. summer salary for participating high school teacher, travel funds for citizen scientists to do fieldwork, travel \$\$ for international students to participate in a class or workshop, supplies for hands-on workshops, etc.)
- an iterative structure (e.g., a workshop that takes place for 3 summers), not just one event
- an assessment plan, with possibility of formative feedback to improve the activity over the course of the project
- listing your classroom and mentor teaching is not persuasive. Reviewers will see these activities as standard elements of every university professors’ job.

General tips

- Use bold-faced topic sentences as appropriate to guide your reader throughout the proposal.
- Use superscript numbers for references to save space.
- Make sure your figures are clear, high quality images. Be sure they include no distracting extraneous information.