How to Write a Winning Proposal

NSF Northeast Student Workshop in Control Engineering

April 23–25, 2010

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What makes a Winning Proposal?

1. Know yourself – strengths/weaknesses (identify your skill set)
2. Learn about the available infrastructure at your Institution
3. Know the program from which you seek support
4. Read the program announcement and GPG
5. Title of the proposal (Brief but Exciting)
6. Formulate clear and appropriate research and education objectives
7. State your objectives up front in your proposal
8. Develop a viable plan
9. Describe clearly the Goals to accomplish your objective
10. Format and brevity are important
11. Know the review process
12. Grammar and spelling count
13. Proof read the proposal before you submit it
14. Submit your proposal early
Proposal Basics

- Write to the reviewers (not to me and not to yourself)
- Your proposal will be judged by the reviewers
- Reviewers want to know four things:
  - What is it about (the research objective)?
  - How will you do it (the technical approach)?
  - Can you do it (you and your facilities)?
  - Is it worth doing (intellectual merit and broader impact)?
- This is, basically, all the proposal needs to convey – but it needs to convey this
• We look for proposals that
  – Are innovative and push the frontiers of knowledge
  – Contribute to national needs and priorities
  – Go beyond marginalia
  – Integrate research and educational goals well
  – Actually involve research

• We do not support (except as incidental to the goals of the award)
  – Developmental efforts
  – Computer programming
  – Design of…
  – Commercialization
The Selected Research Topic

- It must be research
- It must not have been done before
- It must be significant
- There must be higher than probability zero that you can do it (no perpetual motion machines, no fuzzy logic)
- It must lend itself to a viable research plan – there is a research methodology
- You must have the facilities to accomplish the research
- It should fit into your strategic plan
Groundwork

• Know your field:
  – What is the current state-of-the-art
  – Who are the top ten researchers
  – What they are doing right now
  – Where they get their funding
  – What they consider to be the key research issues
  – Who would likely review your proposal
  – What are the grant opportunities
The Research Objective

• How to do it right:
  – The research objective of this project is to measure the cross-section of the muon-nutrino interaction at 5 GeV accurate to 5%.
  – The research objective of this proposal is to test the hypothesis that physical phenomena x,y,z dominate the chip formation process in the machining of brittle materials.
  – The research goal of this project is to account for uncertainty in engineering design decision making through the application of utility theory.
A well-stated objective leads one directly to the approach that must be taken to accomplish the objective.
The Research Objective

• Four acceptable ways to do it right:
  – The research objective of this proposal is to test the hypothesis $H$.
  – The research objective of this proposal is to measure parameter $P$ with accuracy $A$.
  – The research objective of this proposal is to prove conjecture $C$.
  – The research objective of this proposal is to apply method $M$ from field $Q$ to problem $X$ in field $R$. 
The Research Objective

• Do not use words that mean “not research”
  – Develop
  – Design
  – Optimize
  – Control
  – Manage

• Use of words such as these gives the reviewers the impression that you are not doing research, there is no innovation, nothing is new, etc. – your ratings will be lower
Your proposal must address four critical questions that reviewers will face:

- **What is the proposal about?**
  
  » Be sure to include clear statements of both research and educational objectives

- **Will the proposed approach accomplish the stated objectives?**
  
  » Be sure the reviewers are evaluating your approach based on your objectives

- **Can the PI carry out the proposed approach?**
  
  » Preliminary results and previous work argue this

- **Is it worth doing?**
  
  » Make the argument through the broader impact statement
The Next Step

• Look up NSF’s web site: www.nsf.gov
  – Check out research programs, read what research topics they support

• Then call the appropriate program officers
  – Be prepared to answer the question: “What is your research objective?” (25 words or less)
Meeting with a Program Director

Important Questions

• Does my research topic fit well with your program?
• What is your funding policy for CAREER awards? What is the maximum size of your CAREER awards? (Remember, the minimum is $400,000)
• How are CAREER proposals submitted to your program reviewed?
Meeting with a Program Director (2)

• Your program director can:
  – Give advice on proposal submission
  – Help you understand the review of a previous proposal
  – Point you to resources you can use to help write a better proposal next time
  – Give general guidance on good proposal writing
  – Give you ideas for collaborations
Writing the Summary

- The most important statement is your statement of your proposed objectives
  - It should be at the very beginning
  - Do not begin with a weather report: “The sky is falling. Tools are breaking. Designs are failing…”
  - Do not begin with a state-of-the-union address: “It is imperative that the nation develop a strong manufacturing base…”

- Remember, this is not a tech paper, it is not a murder mystery (where we find out what the objective is on page 15)

- Don’t forget the Intellectual Merit and
• First paragraph
  – My long-term research goal is...
  – In pursuit of this goal, the research objective of this CAREER proposal is...
  – The research approach is...

• Second paragraph
  – My long-term educational goal is...
  – In pursuit of this goal, the educational objective of this CAREER proposal is...
  – The educational approach is...

• Third and fourth paragraphs – use headings
  – Intellectual Merit
  – Broader Impact

• Anything else will lower your rating
What We Want to Know

• What are your research and educational objectives?
  – This is what directs your proposal to the appropriate program

• What is your approach?
  – Outline — just a few sentences

• What is the specific research contribution you will make to the knowledge base (the intellectual merit)?

• If successful, what will be the benefit to society (the broader impact)?
Remember

• Your proposal will be returned without review if, in your Summary:
  – You fail to include explicit statements of intellectual merit and broader impact (entitle them Intellectual Merit, Broader Impact – this is not a time for creativity)
  – The font is too small
  – The margins are too narrow
  – The summary exceeds one page
The Rest of Your Proposal

• The next 15 pages of your proposal give backup and detail to your summary
• Start with a restatement of your goals and objectives, clarify them, and provide a plan to accomplish them
• Restate and provide detail on your intellectual merit and broader impact
Tips on Proposal Writing

- Use only 12 point type (approved fonts only)
- Do not use figures or tables as filler – everything should contribute
- Everything should be legible – do not use 2 point type on figures or tables
- Be sure to explain exactly what is your contribution to the knowledge base
- Use only the required format
- Be sure to include intellectual merit and broader impact statements in the body of the proposal
Tips on Proposal Writing

• Don’t include letters of collaboration if
  – They aren’t very collaborative
  – Multiple letters are identical
  – They are letters from previous proposals
  – You don’t have them before the submission deadline
  – They are letters of recommendation

• Don’t cut and paste together your new proposal from old declined proposals

• Submit your proposal early, download it, proofread it and withdraw and correct it if necessary before the
Mentoring for Postdoctoral Researchers

- All proposals submitted after April 6, 2009, that include funding to support postdoctoral researchers must include as a supplementary document a 1-page description of the mentoring activities that will be provided for such individuals.

- Mentoring activities may include:
  - 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; and
  - Training in responsible professional practices.
• Proposed mentoring activities will be evaluated as part of the merit review process under the Foundation's broader impacts merit review criterion.

• Proposals that do not include a mentoring plan will be returned without review.
Follow the NSF Guidelines
www.nsf.gov

- Proposal & Award Policies & Procedures Guide (PAPPG)
  - Grant Proposal Guide (GPG)
- Program Solicitation
- Budget guidelines
• Provides guidance for preparation and submission of proposals to NSF;
  – Allowable fonts, margins, page limits, bio format, etc.
  – Process for deviations from the GPG (there will be none)
  – Process and criteria by which proposals will be reviewed
  – Reasons why a proposal may be returned without review
  – Reconsideration process
  – Process for withdrawals, returns & declinations
  – Award process and procedures for requesting continued support
  – Budget line item definitions
  – Process for submission of collaborative proposals (subawards and multiple proposals)
Intellectual Merit and Broader Impact Statements

• They are required
• Your proposal will be rated based on them
• But:
  – What are they?
  – What should you include?
  – How should they shape your proposal?
The Intellectual Merit is the contribution that your research makes to the knowledge base.

Questions:
- What is already known?
- What is new?
- What will your research add?
- What will this do to enhance or enable research in your or other fields?
• The Broader Impact focuses on the benefit to society at large as a result of your research result

• Means to benefit society include:
  – Economic/environment/energy
  – Education and training
  – Providing opportunities for underrepresented groups
  – Improving research and education infrastructure
My research goal is... In pursuit of this goal, the research objective of this CAREER proposal is to test the hypothesis that the propensity of a tree to break is directly proportional to how many monkeys are in the tree. The approach will be to take a sample of ten trees and load them with monkeys until they break...

My educational goal is... In pursuit of this goal, the education objectives of this CAREER proposal are... The approach to accomplishing these objectives will be...

Intellectual Merit – It is important that we know how many monkeys can climb a tree before it breaks because this affects our perceptions of monkey procreation and... The Snerd Theory holds that tree size limits monkey procreation. This study challenges that theory with the notion that... If the objective hypothesis is correct therefore, it will transform our approach to...

Broader Impact – Monkeys are used in medical research. By knowing how many monkeys can fit in a tree, we will be able to provide more monkeys for such research thereby advancing medical science more quickly and improving the quality of life. Also, by watching the monkeys get hurt when the tree breaks, graduate students will be less likely to climb trees, thereby increasing their probability of graduating.
Education

- Undergraduate
  - Curriculum
  - Projects (REUs)
- Graduate
  - Curriculum
  - Conferences
  - Involvement with industry, national labs
- Networks, partnerships
- K–12 outreach (RETs)
- Museum projects
- Should not be a boiler plate, pick and choose
Annual Reports

• Annual reports are required for ALL grants (standard or continuing)
  – This includes: unsolicited, CAREER, MRI, special initiatives, ...
  – This includes grants that are beyond their initial active period, i.e., grants that are in a no-cost extension period

• Annual reports must be submitted via FastLane 90 days PRIOR to anniversary (or by May 1st, whichever is sooner, for continuing grants)

• Annual reports MUST be submitted in the order in which they are due as they build upon previous report(s)
Annual Reports

- No annual report = no increments, no supplements, no no-cost extensions, no new awards (for PIs or Co-PIs)
- Be sure to use FastLane format — pdf attachments are ok
- REU supplement during reporting period – make sure to report activity under role of Research Experience for Undergraduates in PARTICIPANT section (this is different than role of undergraduate student)
Final Reports

- All grants require a final report
- All final reports must be filed using FastLane
- Final reports are due not later than 90 days after the expiration date of the grant
- You must use the FastLane format
- PENALTY!!! You cannot get another grant or a supplement if you or a co-PI have an overdue final report
- Warning – the grant is over when the final report is approved
Be A Reviewer

- Proposal review is an important service to your community
- There's no better way to see how the system works
- There's no better way to understand what makes a winning proposal
- If you think the system is unfair, try being part of it
How to Volunteer

• Contact your program director
• E-mail a brief (1-page) bio to your program director
• Be sure to include your contact information
• Indicate your areas of expertise

This will get you an expense-paid trip to visit your program director
Thank you!