Top 10 Things You Can Do To Write an Effective Grant Application

1. Contact the institute in advance of submission; develop a relationship with a project officer or other institute representative and seek specific advice about your project.

2. Read the *CSR Insider's Guide to Peer Review for Applicants:* file:///C:/Users/PC/Desktop/U%20Iowa/NIH--CSR%20Insider%E2%80%99s%20Guide%20to%20Peer%20Review%20for%20Applicants--2016.html Watch the updated video stream *Inside the NIH Grant Review Process* (search "peer review video" at nih.gov). Take the "Grant Application Basics" tutorial (search "grant application basics" at nih.gov). Review the 2010 NIH Quick Guide for Grant Applications (http://deainfo.nci.nih.gov/extra/extdocs/gntapp.pdf). Review the information under "enhancing peer review" at nih.gov. Review the NIH Roadmap.

3. Review successful applications (and their project descriptions) to look for effective ways proposal writers have conveyed their ideas; adapt these strategies to fit the purpose and direction of your project. Carefully read them and the funding agency's requests for applications (RFAs) or project announcements to get a sense of the language used.

4. Develop relationships with collaborators and mentors who can advise you and serve as consultants on your project.

5. Write clearly. Use a consistent paragraph structure that puts a topic sentence at the start of each paragraph. Be sure that each individual sentence conveys a single main idea. Format sentences so that the new or more important information appears in the second half of the sentence, which is the natural position of emphasis.

6. Use logical subheadings and a numbering system that ties together different sections so that the reviewer can skip around the application. Use bold *only* for subheadings or for very important topic sentences at the start of paragraphs.

7. Use figures, images, and tables to convey not only your preliminary results but the background and your thinking and approach. In figure legends, include statements that emphasize the benefits or significance of the figure to your proposal.

8. Make it visually appealing: use line spaces between paragraphs; set margins to 0.7 inch or 0.8 inch, and not 0.5 inch. Keep paragraphs manageable—four or more paragraphs per page is ideal. Provide ample "white space" and avoid dense blocks of text and awkward text wrapping.

9. Employ the feature–benefit – proof model: "sell" the idea by stressing the benefits of each feature of your proposal. Include a "significance" paragraph at the end of each major section. Stress how the project addresses the mission of the funding agency or specific institute of the NIH and to the Public Health Service ("to improve the health of Americans").

10. Get feedback early and often in the process. Have both experts and "intelligent non-experts" review the proposal to provide edits and suggestions about how to improve the both the science and the clarity of the message.

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To be successful, your application must possess three characteristics:

- Excellent science
- Flawless packaging
- A clear emphasis on the benefits of each feature of the proposal and how the project as a whole serves the priorities of the institute or advances the mission of the grantor

Excellent Science contains three elements:

- A basic idea that is novel, significant, and based on sound, logical principles
- An experimental approach that is technically feasible
- A study design that is adequate to achieve an answer that is as unambiguous as the state-of-the-art permits (adequate number of experiments, suitable planning for controls, and a workload that is appropriate to both the dollars and the time frame)

Flawless packaging means

- Following all the format guidelines
- That the proposal is clear, concise, well organized, and that it facilitates the reader's understanding and "intellectual skimming" of the application

How the project serves the priorities of the institute need to be emphasized

- In the Project Description (Instructions begin: "State the application's broad, long-term objectives and specific aims, making reference to the health-relatedness of the project.")
- In the introduction paragraph in the Specific Aims
- In the Significance and Innovation sections
- Wherever possible and appropriate in the Research Plan

"Selling" your proposal: the "feature-benefit-proof" model

For each feature, or point you make in your proposal, be sure to identify the benefit (the importance, the significance, the relevance, the value) of that feature to the successful completion of that project, and any proof you have to support it. This is the extent to which you can "sell" your proposal and at the same time maintain your scientific objectivity; you make every effort to identify and highlight the reasons that support your ability to complete the project successfully, and you give evidence for it.

For example:

> "Preliminary Study 2 gave us the experience we need to perform this type of assay with this type of cell line. Similar assays will be necessary to complete Experiment X.y."
>
> "We plan to take this approach because it will allow us to…

Important steps to take before submitting your proposal

- Review excellent "Grant Application Basics" tutorial at http://www.niaid.nih.gov/ncn/grants/basics/index.htm
- Publish articles in peer-reviewed journals that you can use as preliminary studies or cite in your Innovation and Significance sections
- Search the institute's website via nih.gov to learn about the institute's priorities and other issues, including how to "speak the language" of the field
- Write to the institute with the aim of developing a correspondence with a Scientific Research Administrator in your specific area
- Review successful proposals to look for effective ways proposal writers have conveyed their ideas; adapt these strategies to fit the purpose and direction of your project
- Develop relationships with collaborators and mentors who can advise you and serve as consultants on your project
- Construct a timeline to manage the proposal writing process, complete with time set aside for informal peer review and revision. Dedicate a specific time per day to work on the project.
- Review the guidelines for reviewers to asses the criteria by which they are asked to judge your application; use this information to inform your writing to address their needs

FORMAT SUGGESTIONS

Font

- Text: 11-pt Arial. Bold for headings.
- Tables: 10-pt Arial
- Figure legends: 10-pt Arial bold

Margins

Most applicants will use 0.5-inch margins, the smallest allowed. Consider setting your margins at 0.7 or 0.8 inch for readability.

Paragraphs

- Set up your paragraphing so that there is a 9-point line space between each paragraphs (indent with line spaces)
- use subheadings and a numbering system for as many paragraphs as is logical
- use Left Alignment, not Full Alignment

Images, figures and tables

You'll want to make excellent use of these to make the reviewers' work to understand your proposal as easy as possible. Graphics are not just for data anymore. Consider ways of graphically conveying your long-term objective and specific aims, and/or your hypotheses and methods. Use conceptual models, decision trees, and flow charts, and tables. Show examples and pictures. Use color. Definitely include a timeline.

Try to include one figure or table per page. Be sure that your figures and tables are balanced on the page. Either use the entire width of the page or put them on the right margin, preferably at the very top or bottom of the page.

Research Strategy
1. Introduction to Application (Resubmission or Revision Applications only)—1 page
2. Specific Aims—1 page
3. Research Strategy—6 or 12 pages a. Significance b. Innovation c. Approach • Preliminary Studies for New Applications • Progress Report for Renewal/Revision Applications

1. Introduction to Application (Resubmission or Revision Applications only; 1 page)

Purpose is to

- Show how you revised the proposal in response to the critiques
- Justify the revisions
- Direct reviewers to the revisions in the proposal

ALSO

- Show that you can be flexible
- Show that you value the critiques and suggestions

Response to reviewers: format

First paragraph

- Thank reviewers for their critiques
- Mention that their suggestions have allowed you to strengthen the proposal (in the following ways…)

Following paragraphs

- List critique or summarize reviewer suggestion
- Detail how you revised the application to reflect the reviewer's comment; list section or page number in which the revision appears

Response to reviewers: tone

- Genuinely thankful for the guidance to improve the proposal
- Enthusiastic about the added strength of the proposal
- Detail-oriented
- Able to see the big picture and added benefits of revised proposal

2. Specific Aims (1 page)

One of the most common edits I make on this section is to move background information on the topic that authors typically put at the very beginning, and instead *frame* the topic from the point of view of the proposal as a whole, the big picture. The most important background information can still be included, but you convey to the reader that you have full command of your project if you give the background within the framework the proposed project. For example:

Paragraph 1
The *long-term goal* of our research is to…. [3 or 4 sentences that give the background necessary to justify this long-term goal].

Paragraph 2
The *objective of this project* is… [a few sentences that give the background necessary to justify this objective].

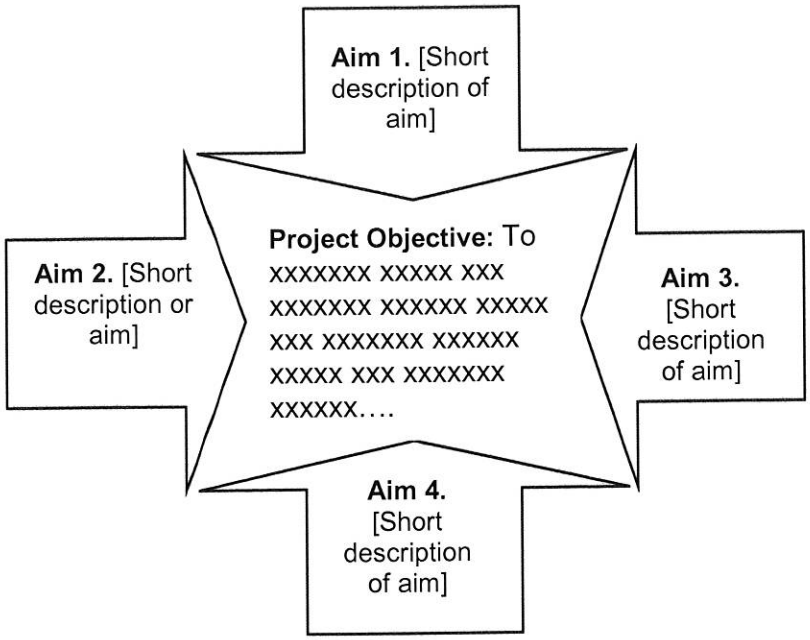
Paragraph 3.
The *central hypothesis* is….. The *rationale* is…. Our *specific aims* are

1. To….
2. To…
3. To… [remember, the aims should be related but not interdependent. Also, they should be specific, as measurable as possible, and have a clear goal]

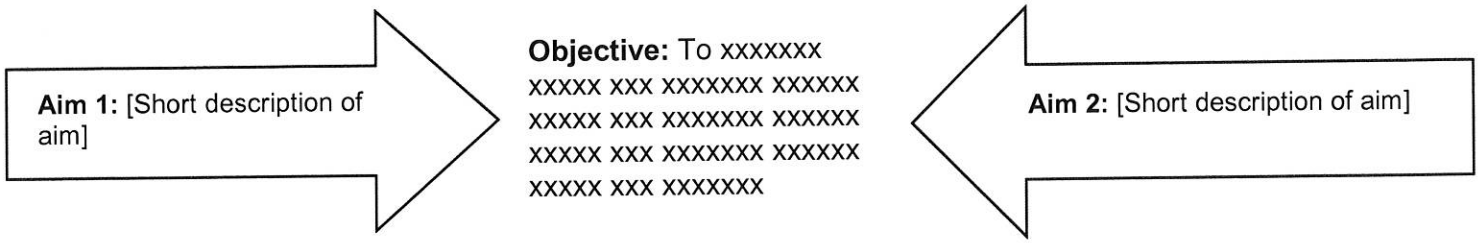
[figure]
Figure 1. A graphical representation of the aims and how they address the objective of the application (this doesn't have to be fancy; words inside of arrows will do). This should appear at the bottom or bottom-right or bottom-left.

Paragraph 4.
This work is *innovative* in that…. (or other things that set this work apart from the other applications)

Paragraph 5
(Impact statement) Successful completion of this project will… (address mission of institute, health-relatedness, NIH Roadmap; make other benefit statements)



Example—4 aims. For 3 aims, delete the top arrow and renumber the aims. [The text and arrows in this can be revised and resized]



Example—2 aims. [This one can be copied, revised, and pasted into a word document]

3. Research Strategy: ***How are you going to do the work?*** (6 to 12 pages, depending on the instructions)

- 3.1. Significance (one-half to one page)
- 3.2. Innovation (one-half to one page)
- 3.3. Approach (5 to 12 pages)
  - 3.3.1. Approach for Aim 1
    - 3.3.1.1 Design, Rationale, and Significance
    - 3.3.1.2. Methods for Aim 1
      - Limitations
      - Difficulties anticipated
      - Alternative approaches
      - Sequence
    - 3.3.1.3 Analysis of data
    - 3.3.1.4. Interpretation of anticipated results
  - 3.3.2. Approach for Aim 2
    - (and so on, as in 3.3.1)
  - 3.3.3. Approach for Aim 3
    - (and so on, as in 3.3.1)

Time table

Seven Fundamental Questions reviewers ask about an application

1. Are the aims logical?
2. Is the hypothesis valid?
3. Are the procedures feasible, adequate, and appropriate for the research proposed?
4. Is the research likely to produce new data or concepts or confirm existing hypotheses?
5. What is the significance and originality of the proposed study in its scientific field?
6. Are the principle investigator and the staff qualified to conduct the proposed word, as judged by their demonstrated competence, academic credentials, research experience, and productivity?
7. Are the facilities, equipment, and other resources adequate for the proposed work, and is the environment conducive to productive research?

Qualifications for Scholarship

According to Eaves, "the single most important requirement for a beginning investigator's successful completion of a grant is a demonstration of outstanding qualifications." These extend beyond the biographical sketch; they include the ability to

1. think clearly and logically
2. express logical thought clearly and cogently
3. discriminate between the significant and the inconsequential
4. display technical prowess
5. handle abstract thought
6. analyze data objectively and accurately
7. interpret results confidently and conservatively

Information on this page was adapted from Eaves G. Preparation of the research grant application: opportunities and pitfalls. *Grants Magazine* 1984.

EXAMPLES OF INSTITUTE MISSION INFORMATION

1.

NIAID Overview

Introduction

The National Institute of Allergy and Infectious Diseases (NIAID) conducts and supports basic and applied research to better understand, treat, and ultimately prevent infectious, immunologic, and allergic diseases. For more than 50 years, NIAID research has led to new therapies, vaccines, diagnostic tests, and other technologies that have improved the health of millions of people in the United States and around the world.

Expanded NIAID Research Portfolio

The scope of the NIAID research portfolio has expanded considerably in recent years in response to new challenges such as:

- bioterrorism
- emerging and re-emerging infectious diseases including:
  - acquired immunodeficiency syndrome (AIDS)
  - severe acute respiratory syndrome (SARS)
  - West Nile virus
  - malaria
  - tuberculosis
- the increase in asthma prevalence among children in this country

2.

Mission: National Institute of Arthritis and Musculoskeletal and Skin Diseases

The mission of the National Institute of Arthritis and Musculoskeletal and Skin Diseases is to support research into the causes, treatment, and prevention of arthritis and musculoskeletal and skin diseases, the training of basic and clinical scientists to carry out this research, and the dissemination of information on research progress in these diseases.

3.

National Institute of Biomedical Imaging and Bioengineering (NIBIB) -

The mission of the NIBIB is to "improve health by promoting fundamental discoveries, design and development, and translation and assessment of technological capabilities. The Institute coordinates with biomedical imaging and bioengineering programs of other agencies and NIH institutes to support imaging and engineering research with potential medical applications and facilitates the transfer of such technologies to medical applications."

Example of reviewer criteria—from http://grants.nih.gov/grants/peer/critiques/rpg.htm#rpg_01

Definitions of Criteria and Considerations for Research Project Grant (RPG/R01/R03/R15/R21/R34) Critiques

Significance.
R01, R03, R21, R34. Does the project address an important problem or a critical barrier to progress in the field? If the aims of the project are achieved, how will scientific knowledge, technical capability, and/or clinical practice be improved? How will successful completion of the aims change the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field?

R15. Does the project address an important problem or a barrier to progress in the field? If the aims of the project are achieved, how will scientific knowledge, technical capability, and/or clinical practice be improved? How will successful completion of the aims change the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field? If funded, will the AREA award have a substantial effect on the school/academic component in terms of strengthening the research environment and exposing students to research?

2. Investigator(s).
R01, R03, R21, R34. Are the PD/PIs, collaborators, and other researchers well suited to the project? If Early Stage Investigators or New Investigators, or in the early stages of independent careers, do they have appropriate experience and training? If established, have they demonstrated an ongoing record of accomplishments that have advanced their field(s)? If the project is collaborative or multi-PD/PI, do the investigators have complementary and integrated expertise; are their leadership approach, governance and organizational structure appropriate for the project?

R15. Are the PD(s)/PI(s), collaborators, and other researchers well suited to the project? If Early Stage Investigators or New Investigators, or in the early stages of independent careers, do they have appropriate experience and training? If established, have they demonstrated an ongoing record of accomplishments that have advanced their field(s)? If the project is collaborative or multi-PD(s)/PI(s), do the investigators have complementary and integrated expertise; are their leadership approach, governance and organizational structure appropriate for the project? Do the PD(s)/PI(s) have suitable experience in supervising students in research?

3. Innovation.
Does the application challenge and seek to shift current research or clinical practice paradigms by utilizing novel theoretical concepts, approaches or methodologies, instrumentation, or interventions? Are the concepts, approaches or methodologies, instrumentation, or interventions novel to one field of research or novel in a broad sense? Is a refinement, improvement, or new application of theoretical concepts, approaches or methodologies, instrumentation, or interventions proposed?

4. Approach.
R01, R03, R21, R34. Are the overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project? Are potential problems, alternative strategies, and benchmarks for success presented? If the project is in the early stages of development, will the strategy establish feasibility and will particularly risky aspects be managed? [continues]

EXERCISE: Project Description
Howard Butcher, Written Emotional Expression & Caregiver Burden Outcomes
Funded 2003

The purpose of this study is to evaluate the effect of structured written emotional expression (SWEE) in decreasing the emotional and physiological burdens in family caregivers of persons with Alzheimer disease and related disorders (ADRD). SWEE is an intervention postulated to facilitate the making of meaning and involves asking participants to write for a brief an account expressing their deepest thoughts and feelings about a stressful and traumatic experience. Negative consequences from the stress of ADRD caregiving are well documented in the research literature with family caregivers being more stressed, burdened, and depressed than non-caregivers. The specific aims of this study are to: 1) determine the effect of SWEE on finding meaning (Finding Meaning Through Caregiving Scale); 2) determine the mediating effects of finding meaning on caregiver burden (Burden Interview), depression (CES-D), self reported physical symptoms (Pennebaker Inventory of Limbic Languidness), and salivary cortisol measured QID over two days; and 3) determine the effect of SWEE on caregiver burden, depression, self-reported physical symptoms, and salivary cortisol. Caregivers will experience a total of three 20-minute writing sessions scheduled every other day. All outcome measures will be collected at pretest, 4th and 5th day post-test, and twice at one-month post intervention. The researchers hypothesize that caregivers experiencing SWEE will report higher provisional finding meaning and that higher provisional meaning is positively associated with lower caregiver burden, decreased depression, decreased self-reported physical symptoms, and decreased salivary cortisol dysregulation. Given the negative health outcomes in family ADRD caregivers, an easily administered and low cost intervention that has an impact on improving the health outcomes is both significant and timely.

List the purpose behind each of the sentences in this project description:

1.

2.

3.

4.

5.

6.

7.

8.