Writing an outstanding grant:

Insights from the reviewer’s perspective

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“How to Write a REALLY Bad Grant Application
(and other helpful advice for scientists)"
http://www.authorhouse.com/BookStore/ItemDetail~bookid~27713.aspx
http://grants1.nih.gov/grants/

- Grants - Office of Extramural Research (OER)
  Home Page http://grants1.nih.gov/grants/oer.htm
  - Funding Opportunities
    - RFAs, PAs
  - Applications and Forms
  - Awarded Grants
    - CRISP database searches
  - Grants Policy
    - Grants Policy and Guidance
    - Laboratory Animal Welfare (OLAW)
    - Human Subjects (OHRP)
    - Peer Review
      - Rosters of Scientific Review Groups
      - Peer Review Policy Documents
      - Overview of Peer Review Practices and Guidelines
The NIH application time-line

What happens after the grant application deadline?

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>Process Description</th>
</tr>
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| 0-2 month later  | Grant is assigned to
|                  |   - Review group (study section)                                                                                                                   |
|                  |   - Funding agency (NIDA, NCI, NIDDK, etc)                                                                                                          |
|                  |   - Actual reviewers (usually 3-4)                                                                                                                  |
| 2-4 months later | Grant is read by reviewers                                                                                                                           |
| 4-5 months later | Meeting (typically 20-25 scientists)                                                                                                                  |
|                  |   – Grant is presented by 1° reviewer                                                                                                               |
|                  |   – Discussed by 2°, 3°, and anyone else                                                                                                             |
|                  |   – Reviewers recommend scores                                                                                                                        |
|                  |   – Everyone writes down their score                                                                                                                 |
| 7-8 months later | Council meets                                                                                                                                    |
|                  |   – decides on which applications to fund                                                                                                             |
Key point #1

• You’ve got to get the 3 reviewers excited about your application

How do you get the reviewers excited?
- Get your application to the right study section
- Write an exciting application
  - Make it interesting
  - Avoid common mistakes
  - Address the criteria the reviewers are using
The “Criteria” (to be used as of October 12, 2005)

Significance:

- Does this study address an important problem?
- If the aims of the application are achieved, how will scientific knowledge or clinical practice be advanced?
- What will be the effect of these studies on the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field?
Approach:

- Are the conceptual or clinical framework, design, methods, and analyses adequately developed, well integrated, well reasoned, and appropriate to the aims of the project?

- Does the applicant acknowledge potential problem areas and consider alternative tactics?
Innovation:

- Is the project original and innovative?
  - Does the project challenge existing paradigms or clinical practice; address an innovative hypothesis or critical barrier to progress in the field?

- Does the project develop or employ novel concepts, approaches, methodologies, tools, or technologies for this area?
**Investigators:**

- Are the investigators appropriately trained and well suited to carry out this work?

- Is the work proposed appropriate to the experience level of the principal investigator and other researchers?

- Does the investigative team bring complementary and integrated expertise to the project (if applicable)?
Environment:

• Does the scientific environment in which the work will be done contribute to the probability of success?

• Do the proposed studies benefit from unique features of the scientific environment, or subject populations, or employ useful collaborative arrangements?

• Is there evidence of institutional support?
The Score

- The score reflects the overall impact based on the five review criteria.

- The best possible priority score is 100 and the worst is 500.

- Individual reviewers mark scores to two significant figures (e.g., 2.5) and the individual scores are averaged and then multiplied by 100 to yield a single overall score (e.g., 250).

- Reviewers are also asked to recommend that half the applications not be scored (i.e. triage, or “unscored”).
The “Percentile”

- Research grant applications (R01s) are assigned a percentile rank.

- The conversion of priority scores to percentile rankings is based on scores assigned to applications reviewed during the current plus past two review rounds.
  - i.e. percentile is based on the last three consecutive rounds for that study section.

- Applications other than R01s (e.g., fellowships, small business applications) are not percentiled.
Common Mistakes

The assumption that the reviewers are experts in the field and/or have large amounts of time to devote to reviewing your grant application

Problem: Not enough general background
Too many complicated details or jargon

Or… not enough specific details (if reviewers really are experts in your area)

Solution:
• look at the roster of potential review panels
• find out what each of the reviewers works on
• target your application for the 3-4 members most related to your area.
Common Mistakes

The assumption that your application will be funded if the grant reviewers find it acceptable.

Problem: Not enough “excitement”
Too many “negatives” that make it hard for the reviewers to read

Solution:
Get the reviewers to be enthusiastic
Make your grant easy to read
   Attractive layout of figures / tables / headings

Avoid negatives:
   Small fonts / margins
   Incomplete / missing references
   Typos
The Three Rules to Writing a Good Grant Application

- Rule #1: State the obvious (but not so obvious).

<table>
<thead>
<tr>
<th>Obvious to you, but not reviewers</th>
<th>Obvious to everyone: Do not mention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why your proposed experiments are important.</td>
<td>Why you wrote the application (i.e. because you really need $$$).</td>
</tr>
<tr>
<td>The key observations in the field that provide background necessary for interpretation of the experiments.</td>
<td>The genetic code, the periodic table, or anything you learned in kindergarten.</td>
</tr>
<tr>
<td>The critical controls that you always do.</td>
<td>The details on how to make a stock solution of 1 M sodium chloride.</td>
</tr>
</tbody>
</table>
The Three Rules to Writing a Good Grant Application

- Rule #1: State the obvious (but not so obvious).
- Rule #2: Keep it simple (don't confuse the reviewers).

Do NOT go into excessive detail for areas that are irrelevant to the central questions you're addressing.

DO discuss the complexity of the problem while reducing it to a simple form that the reviewers can understand.

   Diagrams or drawings of models are often helpful

Minimize abbreviations (especially non-standard ones)

   Hint: define abbreviations in the top sheet of the appendix.
The Three Rules to Writing a Good Grant Application

• Rule #1: State the obvious (but not so obvious).
• Rule #2: Keep it simple (don't confuse the reviewers).
• Rule #3: Get the reviewers to be excited about your project
  – Avoid negatives (don’t piss-off the reviewers)
    • Follow rules / directions
    • Pay attention to small details (avoid typos and confusion)
  – Make it “fun” and exciting
    • Attractive layout
    • Think $1,250,000 ! (with overhead, over $2 million!!!)
Key Point #2: Get Advice from Colleagues

• Who?
  – Friends, advisors, anyone who has a general idea about your system.

• When?
  – When selecting topic and deciding on Aims
  – When rough draft is complete
  – When “final” draft is complete

• Listen to their advice!!!
  – If they don't understand something…
    DON’T just explain it to them.
    DO rewrite so that it is clear in the grant application.
The Abstract

Before the review
• targets the application to the best review panel

During the review
• concisely describes the proposed experiments to the reviewers

After the review
• helps NIH agencies decide which “borderline” applications to fund
Specific Aims

• Usually 3-5 Specific Aims.
  – Each aim should be independent
  – However, they should collectively address the central hypothesis

• Typically,
  – the first aim has the most preliminary data and is virtually guaranteed to succeed.
  – the second aim is usually more exciting than the first, and reasonably certain to succeed.
  – the subsequent aims become increasingly more exciting, and are also less likely to succeed
Background and Significance

Background
- Briefly explain what is known
- Keep it brief and focused on the application

Significance
- Describe how your proposal is important
- Explain why your proposed experiments are an important extension of your preliminary studies
- Explain how your project will fit into the field and (hopefully) solve an important question
Preliminary Data

• This is NOT like the Results sections of a paper
  – Include Methods and Discussion
  – Why you did the experiments?
  – What do the results mean?
    • i.e. the "big picture"

• Real “preliminary” data is OK if you don’t over-interpret it
  – Be cautious about making sweeping claims from a limited number of observations.
Research Design

Objective: to explain the general design of the experiments

• Do NOT copy many pages of detailed lab protocols from a "methods" book
  • 1-2 pages of general methods can be OK, but not more
  • Best approach: have technical details in Preliminary Results section (figure legends) and/or in publications in Appendix

• DO describe
  – a brief rationale for each Specific Aim
  – the general procedures you'll use (cite references)
  – how you'll interpret your results
  – potential problems and solutions to them
Appendix

- Do include relevant papers (including in press and submitted)
- Do not include papers that aren’t related to the application
- Do include glossy prints of any figures in application that don’t photocopy well
- Do not increase the size of these figures, or add extra ones not in the application
- Do include a list of abbreviations used in grant application on top page of appendix
The Supplement

- Do submit one if you have new data that helps
- Do NOT submit one if
  - new data proves your theory wrong
  - key experiment was not done
- Variability between study sections as to what is allowed