

Writing Research Proposals

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Overview

- **Grants as a basic mechanism in science**
- **Writing research proposals**
- **Writing winning research proposals**
- **Concluding remarks**

Eighteen fundamental skills of a scientist

1. How does science work?
2. What is research?
3. Identifying good research problems
4. Writing papers
5. Presentation in front of an audience
6. **Obtaining funding**
7. Reviewing/refereeing the work of others
8. Teaching
9. Guiding students, running a lab, managing projects
10. Scientific creativity
11. Information finding
12. Career planning
13. Interacting with people and networking
14. Marketing your skills: job hunt
15. Balancing your life between work and family
16. Coping with stress
17. Ethics in science
18. Appreciation for quality rather than quantity

Research grants

Research grants are one of the basic mechanisms in science:

- It means allocating a piece of (limited) resources to you.
- It is an indirect way of saying to you: This is a good piece of research. It is the right thing to do now.
- Gives you money to buy equipment, to travel, to fund doctoral students who will do the groundwork for you.
- It is amazing what you can do with money: There is never enough of it 😊.
- Money comes with some duties, such as progress reports, progress meetings.

Funding agencies (USA)

- **National Science Foundation (NSF)**
- **National Institute of Health (NIH)**
- **Military agencies: DARPA, Navy, Air Force, Army**
- **Departments (Energy, Education, Homeland Security)**
- **International organizations (e.g., NATO, EU)**
- **Foundations**
- **Industry**

Know and manage your funding agency

- **Read the call for proposals (CFP) carefully.**
- **Try to understand the motivation of the agency.**
- **Understand their criteria, and write your proposal to address these criteria.**
- **Focus on writing a good proposal, describing good research that you are genuinely excited about.**
- **Follow the formatting instructions carefully (in particular, do not even think of exceeding the page limit or reducing the font size below what is required).**
- **Contact the program manager (phone works better than Email), who is typically interested in good research.**
- **Build your relationships.**

Should I submit?

- How important is the money for you?
- There is a whole spectrum of possible approaches.
- The two ends of the spectrum are:
 - **Follow the money:** Looking around for CFPs, reacting to them if they are not too far from your area of interest, and adjusting the direction of your work to the grants that you get.
 - **Follow your heart (and brain):** Go after the money only if it coincides with what you would want to do.

Choosing a Topic

- You must absolutely be *specific* about the problem that you are going to solve.
 - A value statement like “I’ m going to work on improving this class of problems” will kill your proposal.
- The problem that you are proposing to address must be *useful/interesting*.
- The proposal has to be *realistic* – it must be clear to the reader/reviewer/program director that you can do it.
- Remember Simon’ s four basic questions to ask yourself of when picking a research topic? Apply them here!

Herbert Simon's 4 questions

- **Novelty: Will I be the first to answer this question?**
 - NSF: Merit Criteria
- **Importance: Will anybody care about the answer?**
 - NSF: Broader Impact Criteria
- **Feasibility: Is this question solvable within the given amount of time?**
 - Match the proposed length, money, team size to the task
- **Personal Fit: Do I have good tools to address this question?**
 - *Why you* should get the money?

Your story

- **Here is a well-defined problem that we have identified**
- **It is an important problem (back this up!)**
- **I have a good idea that will work (back this up!)**
- **We are a world-class team (back this up!)**
- **Here is what we hope to achieve**
- **Here is how we plan to build on our idea to achieve it**
- **Here is what we need in terms of resources (i.e., “Give us the money, please” 😊)**
- **Other agency-mandated parts**
 - Evaluation, Go-no-Go criteria
 - Outreach, Educational component
 - Results from past funded projects

Your story

- **Need to relate this to real life and how useful this is going to be.**
- **Write to someone knowledgeable, but not necessary an expert in the narrow field (NSF vs. DARPA)**
- **If you cannot convince your grandmother, you cannot convince the reviewers and the program director.**
- **Be enthusiastic about what you are doing and what you plan to do.**

Summary/abstract

- **Your one-page summary (or abstract) should tell the whole story.**
- **Most of your readers will only read this page.**
- **This page is worth much more than all the remaining pages. Every word is precious.**
- **For NSF Proposals and Beyond**
 - **Intellectual Merit**
 - **Broader Impact**

How are grant proposals reviewed?

- **Normal review** (typically for grant proposals with no deadline). If you are lucky, your proposal will be read by a couple of experts – you need to convince them.
- **Review panels**. Your proposal will be quite likely read carefully by typically one expert in your field and superficially by several people who know the area (but don't have much time to read your proposal in detail). The non-experts may be influential in evaluating your proposal.

Attending Panels

- **If you submit to an agency, which use panel approach, do your best to become a panelist**
 - **You can be on a panel for the same round where you submit your proposal**
- **You will see how the process works from inside, understand what is important, what is not**
- **You will see a good number of weak and some good proposals**
- **You will become known by program directors**

“Lobbying”

- **Some people do lobbying – dropping by at the agency’s office, talking to the program director to advertize their work.**
- **Some universities organize trips for their faculty to Washington, D.C., to facilitate lobbying 😊.**
- **Some people go so far as to help program directors in creating a CFP!**
- **You can at least ask the program director what they are looking for (and advertize your work in the process 😊).**
- **Build up your relationship: invite them to visit your institution, offer help as a reviewer, ask what you can do to help.**

After you have received the money

- You have resources to do more work.
- You have obligations: progress meetings, progress reports.
- Make sure to acknowledge grant support in all your publications – in their reports, the program directors list publications that result from the grants that they have awarded.
- The program directors will love it if you get Nobel prize or any other significant honor.

How to write a winning proposal?

- **There are many proposals submitted, most of them are weak.**
- **Even the strongest proposal is a lottery – you never know whether you will get the money (a single negative or even a moderate review will kill your proposal).**
- **A poorly written proposal has zero chances.**
- **It is not that terribly hard to change a poorly written proposal into a good proposal.**

How to write a winning proposal?

(1) Convince the reader that you can do it

- **Show that you have a good idea how to solve the problem (a “secret weapon”). You need sound (stand-alone) technical contents in your proposal.**
- **Explain modestly but firmly that you are ideally equipped to do this work – build on your strengths.**
- **Offer objective evidence that support your capabilities to be successful, e.g., preliminary results, publications, prototypes, applications, etc.**
- **Strike a good balance between this evidence and the work to be done (the danger is that the reviewers will think that you have already done the work).**

How to write a winning proposal? (2) Blow your own horn!

- “Blow your own horn” (although, not too strongly 😊)!
- Be modest but not too modest about your prior work (instead of “It has been shown [23] ...” use “I have shown [Smith, 2007] that ...”)
- Use strong words, like:
 - “Our lab has been ranked a major player in the field of Bayesian networks.”
 - “Our software, *GeNIe* and *SMILE*™, is being used by over 15,000 users world-wide.”
 - “The paper describing the AIS-BN algorithm has been recently recognized by the *JAIR* journal the as one of the most influential papers in the field.”

How to write a winning proposal?

(3) The punch line

We are in a perfect position to do this research because:

- **This is the right time to work on this**
- **We have a good idea**
- **Our preliminary results indicate that our idea will work**
- **We are the best people to work on this (from among all people in our field)**

How to write a winning proposal?

(4) The function and structure of the *Related Work* section

- **Two goals:**
- **Demonstrating that you totally know the field.**
 - **Appearing ignorant of relevant related work means a sure failure.**
 - **Could be a place to show your past contribution to the topic**
- **A starting point for describing your idea.**
- **Do not spend too many words on comparative discussion. The experts will know it, the non-experts will not care.**

How to write a winning proposal? (5) Understand the review process!

- **A typical reviewer cannot afford to spend more than a couple of hours on your proposal. They typically form an opinion after the first 30 minutes.**
- **Majority of your reviewers cannot spend more than half-an-hour per proposal and will read it only superficially.**
- **You still need to convince them! They may be influential in the review process and the decision that follow it.**

How to write a winning proposal? (6) The “bottom line”

- Be enthusiastic about what you are doing and planning to do.
- Write simple (just like you would write a paper!).
- Acknowledge all prior work.
- Having a “customer” (someone who wants you to solve the problem) makes your proposal look much stronger. A letter of support/interest is not out of place.

How to write a winning proposal? (7) Have friends and help each other!

- Ask your friends to read your proposals and offer to read theirs.
- Process their comments, rewrite, and ask somebody else
- To every criticism from your reader, respond *“This is very interesting ... Here is what I intended to say ... How could I rephrase this so that you would have understood that?”*
- Better get criticised by your friendly colleagues than by panel member at the meeting.
- Much easier do face to face than by email
- Create a local repository of successful proposals.

How to write a winning proposal?

(7) Have friends and help each other!

- **What someone thinks after a quick reading of your proposal/paper is very important.**
- **After having read many proposals written by others, you will write better proposals yourself.**
- **The effect will be a dramatic increase in quality and an overall higher success ration of your environment (and, hence, easier to say “we are a top team” 😊).**

Concluding remarks

- **You will have to know how to get money, whether you will work in academia, industry, or in a start-up company.**
- **In academia, it will be hard for you to get tenure without a good track record for obtaining research funding.**
- **There is a fine balance between revealing your “secret weapons” (for a better chance of getting the money) or keeping it secret (at a risk that you are not convincing).**
- **Consider CAREER grants when starting as a junior faculty.**