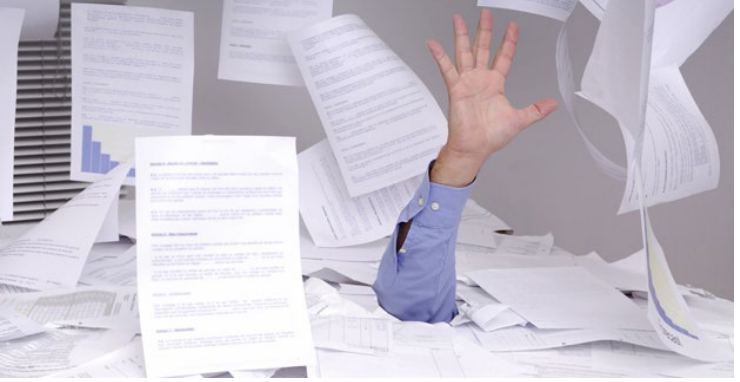

Writing effective research proposals: adventures of a grizzled warrior

Key points:

- Is it only for academics? No! Persuasive writing skills necessary in most professions
- Can be discouraging! Success rates 5-20% in many govt agencies (NSF, NIH, USDA…). Shots on goal...
- Learn to write in constrained format (Shakespeare!); strict page limit, many required elements.
- In industry it may be worse; maybe 1 page limit, even stricter constraints.
- **Proposal is an act of communication with others**. You must consider your audience and use language they will understand. Otherwise your communication will fail.
- Do your homework. Who, and what has been funded by this program before? Keep in mind, those who have recently received funding are likely to be approached by program manager to do reviews.

General elements, organization of your research proposal

Sections:

- Intro
- Background
- Specific Objectives
- Research Plan
- References

Details:

- Keep in mind requirements like line spacing, margins, font type and size
- Number your pages (get in the habit; helps reviewers)

- **Intro**

  Brief description of what your proposal is about. **What is your hypothesis**?

  Significance? (why should we care? "**broader impact**")

  Novelty? ("**intellectual merit**").

  List **Overall Objectives** (big picture elements of what you hope to accomplish).

  Grab the reader here! Remember, this is the section that even the busy people and procrastinators will read.

- **Background**

  Here you will describe what you are doing, and why. You will seek to **convince** those judging your proposal about your arguments for novelty and significance. What key work has been done in this field, how does it demonstrate the importance of the field, and **what it still missing** (that you of course will provide through this proposed research)?

  This key section will provide the framework for what you propose; the "why". For the experts judging your proposal, your analysis of what has gone before will help convince them that you know what you're talking about.

- **Specific Objectives**

  This critical section will lay out your objectives. Just what questions do you wish to resolve? How do they fit together? How do they lead to data that confirms or refutes your overall hypothesis? How do they reinforce your arguments for novelty and significance? For example:

  - SO1 - synthesize a polymer family,
  - SO2 - characterize that family,
  - SO3 - ascertain structure-property relationships with regard to a particular proposed application.

  Here you describe "what" you propose to do.

- **Research Plan**

  For each specific objective you will describe **how** you will do what you hope to do in that objective. Here you would indicate what methods are needed for things like synthesis, characterization, property measurements, and control/comparative experiments. You want to indicate a logical succession of steps, of reasonable chance of success, and within the capabilities of your lab.

  In a real application you would also want to address here "**what if**". What is your "Plan B" for each objective? What are anticipated pitfalls, and how might you modify course to circumvent each one. (That sort of detail isn't necessary for your proposal for this course)

Other elements

Budget

Detail cost elements like grad students, undergrads, postdocs, research assistants and their stipends, tuition, travel, training.

Biosketches

Of each PI and co-PI. The idea is to communicate to reviewers that you and your team actually have the expertise to competently and efficiently do the work proposed.

Facilities and Equipment

Where you will indicate that you have the physical capabilities to do the work (of course you can ask to address gaps in the Equipment section of the budget).