TWELVE STEPS TO A WINNING RESEARCH PROPOSAL

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I have been an NSF program director for 18 years. During this time, I have personally administered the review of some 3,000 proposals and been involved in the review of perhaps another 10,000. Through this experience, I have come to see that often there are real differences between winning proposals and losing proposals. The differences are clear. Largely, they are not subjective differences or differences of quality; to a large extent, losing proposals are just plain missing elements that are found in winning proposals. Although I have known this for some time, a recent experience reinforced it.

I was having lunch with a young faculty person who had come to NSF to sit on her first proposal review panel. I asked her what she had learned from the process. She quickly rattled off six or eight lessons she could take home. And they were all good lessons. My response was, "Good, just learn from this experience and don't

time writing a proposal that has no chance of success from the get-go.

3. Read the program announcement: Programs and special activities have specific goals and specific requirements. If you don't meet those goals and requirements, you have thrown out your chance of success. Read the announcement for what it says, not for what you want it to say. If your research does not fit easily within the scope of the topic areas outlined, your chance of success is nil.

4. Formulate an appropriate research objective: A research proposal is a proposal to conduct research, not to conduct development or design or some other activity. Research is a methodical process of building upon previous knowledge to derive or discover new knowledge, that is, something that isn't known before the research is conducted. In formulating a research objective, be sure that it hasn't been proven impossible (for example, "My research objective is to find a geometric construction to trisect an angle"), that it is doable within a reasonable budget and in a reasonable time, that you can do it, and that it is research, not development.

5. Develop a viable research plan: A viable research plan is a plan to accomplish your research objective that has a non-zero probability of success. The focus of the plan must be to accomplish the research objective. In some cases, it is appropriate to validate your results. In such cases, a valid validation plan should be part of your research plan. If there are potential difficulties lurking in your plan, do not hide from them, but make them clear and, if possible, suggest alternative approaches to achieving your objective. A good research plan lays out step-by-step the approach to accomplishment of the research objective. It does not gloss over difficult areas with statements like, "We will use computers to accomplish this solution."

6. State your research objective clearly in your proposal: A good research proposal includes a clear statement of the research objective. Early in the proposal is better than later in the proposal. The first sentence of the proposal is a good place. A good first sentence might be, "The research objective of this proposal is..." Do not use the word "develop" in the statement of your research objective. It is, after all, supposed to be a research objective, not a development objective. Many proposals include no statement of the research objective whatsoever. The vast majority of these are not funded. Remember that a research proposal is not a

research paper. Do not spend the first 10 pages building up suspense over what is the research objective.

7. Frame your project around the work of others: Remember that research builds on the extant knowledge base, that is, upon the work of others. Be sure to frame your project appropriately, acknowledging the current limits of knowledge and making clear your contribution to the extension of these limits. Be sure that you include references to the extant work of others. Proposals that include references only to the work of the principle investigator stand a negligible probability of success. Also frame your project in terms of its broader impact to the field and to society. Describe the benefit to society if your project is successful. A good statement is, "If successful, the benefits of this research will be..."

8. Grammar and spelling count: Proposals are not graded on grammar. But if the grammar is not perfect, the result is ambiguities left to the reviewer to resolve. Ambiguities make the proposal difficult to read and often impossible to understand, and often result in low ratings. Be sure your grammar is perfect. Also be sure every word is correctly spelled. If the word you want to use is not in the spell checker, consider carefully its use. Not in the spell checker usually means that most people

10. Know the review process: Know how your proposal will be reviewed before you write it. Proposals that are reviewed by panels must be written to a broader audience than proposals that will be reviewed by mail. Mail review can seek out reviewers with very specific expertise in very narrow disciplines. This is not possible in panels. Know approximately how many proposals will be reviewed with yours and plan not to overburden the reviewers with minutia. Keep in mind that, the more proposals a panel considers, the more difficult it will be for panelists to remember specific details of your proposal. Remember, the main objective here is to write your proposal to get it through the review process successfully. It is not the objective of your proposal to brag about yourself or your research, nor is it the objective to seek to publish your proposal. Again, your proposal is a proposal; it is not a research paper.

11. Proof read your proposal before it is sent: Many proposals are sent out with idiotic mistakes, omissions, and errors of all sorts. NSF program managers have seen proposals come in with research schedules pasted in from other proposals unchanged, with dates referring to the stone age and irrelevant research tasks. Proposals have been submitted with the list of references omitted and with the references not referred to. Proposals have been submitted to the wrong program.

they hardly bear mention. What is more, they are all necessary conditions. If you fail on any one of these steps, you will reduce your chance of success to practically nothing. Think about it. If you were a reviewer, would you recommend for funding a proposal that doesn't meet these criteria? So why then do fully half the proposals submitted flagrantly omit them? It's a fact. Most proposals do not follow these simple steps for success. Therein lies your opportunity. If you take the time to follow these steps, your proposal will be that much better by comparison, and you will vastly increase your chance of success. There is a dark side and a bright side to this. On the dark side, it is not easy to write a good proposal. It takes time and effort to assure that all the above steps are met. Indeed, it can take several months to prepare a good proposal. But, on the bright side, if you do take the time to write good proposals, you will have a much higher success rate, and overall you will spend a much smaller fraction of your life writing proposals. Taking the time to do it right really pays off. There are two more things that you can do to vastly improve your prospects for success as an academic researcher. First, you have to know yourself as well as you can. Who are you ? Where are you going ? Where do you want to go ? I strongly urge people, especially young faculty just starting their careers, to write a strategic plan for their life. Where are you today? Where do you want to be in five years, ten years, and twenty years? Then create a roadmap of how to get from where you are to where you want to be in the future. The focus of this roadmap should be the things over which you have control, and it should acknowledge the things over which you have no control. If you can't write such a plan, then your goals for the future are not realistic. You can revise the plan as often as you wish. But the fact that the plan exists will influence your proposal in a very positive way, as it will place the research project you propose into the broad context of your life plan. Finally, no matter how much sense the above steps seem to make, everyone retains a bit of skepticism. "Hey, if this guy really knew what he was talking about, wouldn't he be doing it rather than teaching it?" There is nothing quite like being on the other side of the fence to change your opinion of the process. Volunteer to be a reviewer yourself. It's easy. Just volunteer. Then you will see how you judge proposals. You will see that your opinions are pretty much identical to the other reviewers, and that you rate proposals pretty much the same as everyone else. Then you will see for yourself that these twelve steps provide nothing more or less than what you would be looking for in someone else's proposal that you are reviewing.