

## *Explaining the State of the Art: Telling Your Reviewers What They Need to Know*

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By Lucy Deckard, co-publisher

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When writing a research proposal, it's extremely important to explain to reviewers how your research builds on, and will advance, the current state of the art. This discussion is often included as a "Background," "Innovation," "Significance," or "State of the Art" section. As you develop this section of your proposal, it's important to have a clear understanding of what this section of the proposal must accomplish:

- It provides needed information to help reviewers who may not be experts in the topic of your research understand what you are proposing and why it is significant.
- It points out opportunities that your research will exploit and gaps in knowledge that your research project will fill.
- It demonstrates to reviewers (who may or may not be experts in the topic) that you are well acquainted with the literature and are building on the most recent work on the topic.

### **Understanding What Your Reviewer Needs To Know**

When you are describing the current state of the art in order to bring your reviewers up to speed, it's critically important that you understand how much your reviewers are already likely to know. This seems an obvious point, but it is one that PIs often forget. During the planning process, do all you can to find out the likely backgrounds of your reviewers. The broader and more interdisciplinary the program or solicitation to which you're applying, the more varied the backgrounds of the reviewers are likely to be. Even if you're applying to a core program at NSF, some programs are much broader than others. If you are able to talk to the Program Officer, ask about the likely composition of the review panel in terms of expertise and backgrounds. If you're applying to a standing study section or panel, look up the roster and investigate the backgrounds of the members.

Clearly, if you are likely to have reviewers with backgrounds far removed from your research topic, you will need to explain your ideas and the current state of the art at a different level than if your reviewers are experts in your field. However, you need to be very careful to avoid the common trap of using this section to provide a several-page tutorial or the equivalent of a first-year graduate seminar on your topic. This approach is seductive because many faculty (who have been teaching classes and seminars related to their research topic) find such a discussion very easy to write, but there are several reasons that using the "tutorial" approach is a mistake. First, it will bore reviewers who are well-informed about the topic of your research. Second, it will bore reviewers who are not well-informed about the topic of your research. Third, the material will seem generic and disconnected from your proposed project. Fourth, it will use critical proposal real estate that you need to make the case for why your research is innovative, significant, and should be funded.

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Instead, look at your specific research questions, hypotheses and objectives, and think about what your reviewer needs to know in order to understand:

- What is known now and what are the gaps you will fill?
- How will your research build on what is already known?
- How will your proposed research advance the state of the art, and what will be the impact of those advancements?

If you are addressing reviewers from outside your field, you will need to explain terms, methodologies and challenges in a way that is accessible to them, but avoid lengthy discourses on the basics of your field. If you feel that in order to understand your proposed project, reviewers will need detailed background on a specific methodology or concept, make the description as concise as possible and put it in a separate subsection with a clear heading so that reviewers understand why they are reading the section, and reviewers who already have the required background can skip over it.

### **Connecting to Your Project**

As you discuss the background and relevant work in the literature, be sure to continually connect those discussions to your own project. How is the work you're describing relevant to your project? Does it present interesting results on which you will build? Does it illustrate a gap that you will fill? Does it demonstrate feasibility of a method you will employ? Explaining this relevance is especially important when you have reviewers who are not well-versed in your topic since those connections may not be clear to them unless you discuss them explicitly.

As you discuss relevant literature, be sure that you are focusing specifically on work related to the specific research challenges and objectives of your project, not just on the general scientific area or application. So, for example, if you are proposing to investigate an approach to improve the efficiency of a specific step in synthesizing a biofuel from switchgrass, you should focus specifically on what others have done to address this problem step, other work that employed a similar strategy, etc. Don't use this section to provide a lengthy tutorial on the various types of biofuels and how they are synthesized.

### **Demonstrating Your Knowledge of the Literature**

Remember also that, particularly if you are a relatively early career researcher, you need to reassure the reviewers that you are familiar with the latest developments in your research topic and know the literature well. It is quite common for reviewers to fault a proposal for failing to refer to seminal publications on the topic or work that they feel is relevant. In your discussion of the state of the art, it's a good idea to discuss papers on your specific topic even if their methodology is different, or you feel there are important shortcomings in the work. Briefly and diplomatically mention how your approach will be different or how it will go beyond the reported work. Moreover, if you suspect that colleagues doing similar work are likely to be reviewers, it's wise to respectfully cite their work.

All of these approaches will help to orient your reviewers and demonstrate your knowledge without boring them or using too much critical space in your proposal.