RULES OF WITTE: Tips on grant writing
(courtesy of Prof. Christopher Denny)

As much as I'd like to, I cannot take credit for the following helpful hints. I only hope to pass them on in the spirit of how they were given to me. Of the many bits of information that I gleaned from spending a year in Owen Witte's lab, none has been more valuable than his perspective and pragmatic approach to writing grants. To a remarkable extent, his presentation style has been recapitulated by many who have passed through his lab. It's hard to argue with success after all.

I came to Owen's lab a complete grant writing neophyte. I hadn't as much as seen a grant, much less tried to write one. (One wonders how I was ever hired but that's another discussion entirely.) The first thing that Owen did was describe in very real terms, the task of the grant reviewers and that my precious opus would be one of a hundred that would eventually reside in a large box on the floor of each reviewer's office. Even though each reviewer was primarily responsible for only a subset, in the end all reviewers voted on all grants. The bottom line is that presentation is important if you want the reviewers to like your application, which of course, you very much do.

Rule 1. Keep it simple.

The real trick to effective grant writing is conveying potentially complex concepts in simple terms. It's not that reviewers have poor reading skills but as they are hustling to meet Study Section deadlines, plowing through reams of turgid text does not evoke generous feelings. Therefore strongly consider adhering to the following:

1. *Keep sentence structure simple*. You want your application to read more like the city newspaper - more Hemingway than Kant or Joyce.
2. *Break up text into manageable paragraphs.* When you start to exceed 8-10 sentences, start looking for a paragraph break. Turning the page to find an unbroken "wall o' text" evokes a strong visceral reaction in most reviewers. This is not good.
3. *Break all sections (except Specific Aims) into subsections punctuated by headings consisting of a single short declarative sentence.* Have at least one of these per page. This is not just to make it easier for the primary reviewers but for all the other reviewers sitting around the table. As your grant is being discussed, they can quickly skim through it and come away with a fair idea of your intents.

Rule 2. Liberally use figures and tables.

You can pack a lot of information into tables and figures. A table can be an effective way of summarizing previous work in the field in your Background/Significance section. A schematic can efficiently convey an experimental strategy in the Experimental Design/Methods section. Besides we've all been conditioned to like pretty pictures from a very early age. *Tables and figures should be clear and understandable without the reviewer having to read the corresponding legend.* This is important.

Rule 3. Effectively address the underlying question of each section.

Specific Aims: This is arguably the most important section of the grant because it is here that most reviewers start (and some end). For a quick overview of a grant, reviewers rarely read the Abstract. They go to the Specific Aims. This section should fit on one page consisting of:
1.   A short introductory paragraph explaining underlying rationale and/or general hypotheses to be tested.
2.   An enumerated listing of specific aims stated as short declarative sentences. The use of 3 specific aims is strongly recommended. (You can wonder and argue about the deep psychological basis of the "rule of three" but what works, works…)
3.   Under each aim, append 3-5 sentences explaining general experimental strategies to be used.

Background and Significance: The emphasis is on *significance*. You have about 2 pages to capture the reviewers' interest on why this project should be pursued. If you haven't hooked them by then, apathy starts to set in. Background does not have to be an all encompassing literature review. Just tell them what they need to know in order for the proposed experiments to make sense.

Preliminary Results: Argue why you are an ideal person to pursue this project. This not only includes unpublished data validating your ideas but could also include documented technical expertise and/or accumulation of unique reagents.

Experimental Design and Methods: The emphasis here is on *design*. Focused discussion of experimental rationale, justification of particular strategies, description of controls, anticipation of results and mention of alternative strategies are all good. However, if you ever find yourself inputting things like reagent concentrations and reaction conditions, stop and strongly reconsider. By this time the reviewers either know what you want to do and believe you can do it, or they don't. Either way plugging in the "mM Tris" is not going to help you.

View this advice as a style sheet that has proven effective over many investigators and countless grant applications. This is not dogma. It is not the only way to skin this cat and there are surely other slants to the grant writing problem. Also while effective presentation can make your ideas shine, it won't give substance to a poorly conceived or incompletely developed project. That is another issue altogether that I cannot address here.

The large box from the NIH has arrived and is sitting in a corner in my office. There's a tall stack of grants on my desk and a looming review deadline. I'd better get cracking.

- Chris Denny (January 2002)

Miscellaneous Addenda (July 2004)

1.   In all unbiased screens (gene, protein, etc.), clearly (i) describe potential significance in order to justify performing the screen in the first place and (ii) define selection criteria that will be applied to sort through the positives and come up with candidates for follow up studies.

2.   When presenting preliminary data, don't forget to show controls and remember, the cleaner the data, the better. Don't confuse the reviewers with shoddy technique and/or sketchy results.

3.   Be cautious in only using unjustified cellular model systems in which transgenes are over expressed. Reviewers get easily hung up about the relevance of systems where genes are expressed at supra-physiologic levels.