



NOTES:

Use the Elliott equation* to estimate the time it will take to prepare your proposal:

$$t = 3H + \varepsilon , \quad [1]$$

where t is the time it actually takes to prepare, check, and submit a proposal, and H is the number of hours you think any idiot ought to be able to do it in

*based on >19 years of solid empirical data

This expression approximates the time it actually takes to get a proposal written, uploaded, checked, and submitted by your grants office.

N.B. For most federal agencies, the PI does not submit the proposal to the agency—an arm of the institution's bureaucracy does. Very often all parts of the final proposal must be submitted to the institutional apparatchiks **days** before the funding agency's deadline.

Servers get slower and flakier as the deadline approaches. Everybody else waited until the last minute, too, and they're all trying to upload their 27-MB, graphics-heavy technical descriptions at the same time you are.

It **always** takes much longer than you think it will—always. (You heard it here first.)



Don't bite off more than you can chew. Be realistic in what you say you can accomplish, given the time and \$\$ constraints of your proposal.

Almost all proposals are page-limited. How much can you explain, persuasively and in sufficient detail to convince a skeptical reviewer, in 15 pages?

Reviewers are skeptical people, and they know what things cost, what one person (and one graduate student) can reasonably be expected to do, and how long it will take.

If you overpromise, you risk underdelivering and putting your **next** proposal in serious jeopardy. Nearly every funding agency asks, as part of its proposal review process, "What did you accomplish with the money we gave you last time?"

Ask for advice from people who can help you

From the program officer

From your colleagues

From your business office

Ask early—ask often!

And don't *assume* anything...



From the program officer:

- Ask what kind of projects have been supported.
- Describe your project and ask for suggestions.
- Request referrals to other investigators or prospective collaborators.

From your colleagues

- Ask them to read a first draft of the proposal and give you constructive criticism.
- Ask them to share copies of their successful proposals.

From your business office

- Ask them for boilerplate and templates.
- Ask them to prepare the budget—or at least double-check your numbers.
- Ask them what the procedures are for submitting through your institution's SPO.
- Find out what **their** deadlines are; frequently, a proposal must be submitted to the SPO a week to 10 days in advance of the agency's deadline.

Tip: Have someone not particularly familiar with your field read the project description without taking notes. Then ask him or her to tell you—from memory—what you are planning to do, how you will do it, and why it is significant. If the answers are not clear and immediate, start rewriting. Pay attention to the questions he asks and the things he doesn't understand.

Show how your project will contribute to the funder's mission

Make it clear that funding your proposal will advance the objectives of the agency

Every RFP contains an “objectives” section—quote their words back to them

Put your project in the context of the overall agency mission—look at its website, read its materials



Consider the objectives of the agency, and make it clear that funding your proposal will advance its mission.

Every federal funding agency has a mission statement; every program announcement contains a “program objectives” section. Quote their words back to them and show how your project fulfills these goals.

- Solve an important problem
- Enable new technology
- Strengthen U.S. research capacity and infrastructure
- Develop human resources for science and engineering, particularly among groups who have been traditionally underrepresented in science
- Promote training of the next generation of U.S. scientists and engineers with skills that will allow them to lead the world.

Be able, in one or two sentences, to convincingly explain why a Congressman should *care* about your project.

Put those sentences in your project summary.

Q1: How many proposals were submitted to NSF-CHE in FY09*?

- a) <500**
- b) 750**
- c) 1000**
- d) 1250**
- e) 1500**



***Last year for which I have data**
<http://www.nsf.gov/pubs/2010/nsf10066/nsf10066.pdf>

Number of proposals submitted—approximately 1450

Number of proposals funded—approximately 460

Percent funded—32 percent, but those numbers are deceiving, because FY09 included about \$100M in one-time ARRA funds. Ten-year average is about 25 percent and trending downward.

Start with the RFP and make an individualized checklist



Individual program announcements may deviate from standard policies

Agencies are getting stricter

Decisions are made on the margins

FOLLOW THE RULES. Witlessly adhere to the proposal preparation instructions—NO EXCEPTIONS. Read the fine print. Obey.

Funders' rules and requirements change. Don't assume because you did it this way the last time (as far as you remember...), doing so again is okay. Or that if you got away with it last time, you will this time, too.

Go through the RFP with a highlighter, and make note of all required information and any deviations from standard requirements for that agency.

Everything you've highlighted, put on your checklist.

Structure your proposal so that your sections map exactly to those called for in the program announcement/proposal preparation instructions. Use the same words. Make it very easy for the program director and reviewers to see that you've included all mandatory material.

Pay particular attention to:

- Fonts, margins, page limits.
- All points specified in the project description.
- All required sections.
- All required budgetary information.
- IRB and other certifications.
- Postdoctoral mentoring plan.
- Data management plan.
- Ethics training.

Many agencies provide a standard checklist for proposals—use it!

Include some extra sections (think “prospectus”)



Qualifications of key personnel

Timeline

Specific deliverables

**Contributions to research infrastructure and
human resources**

Plan B

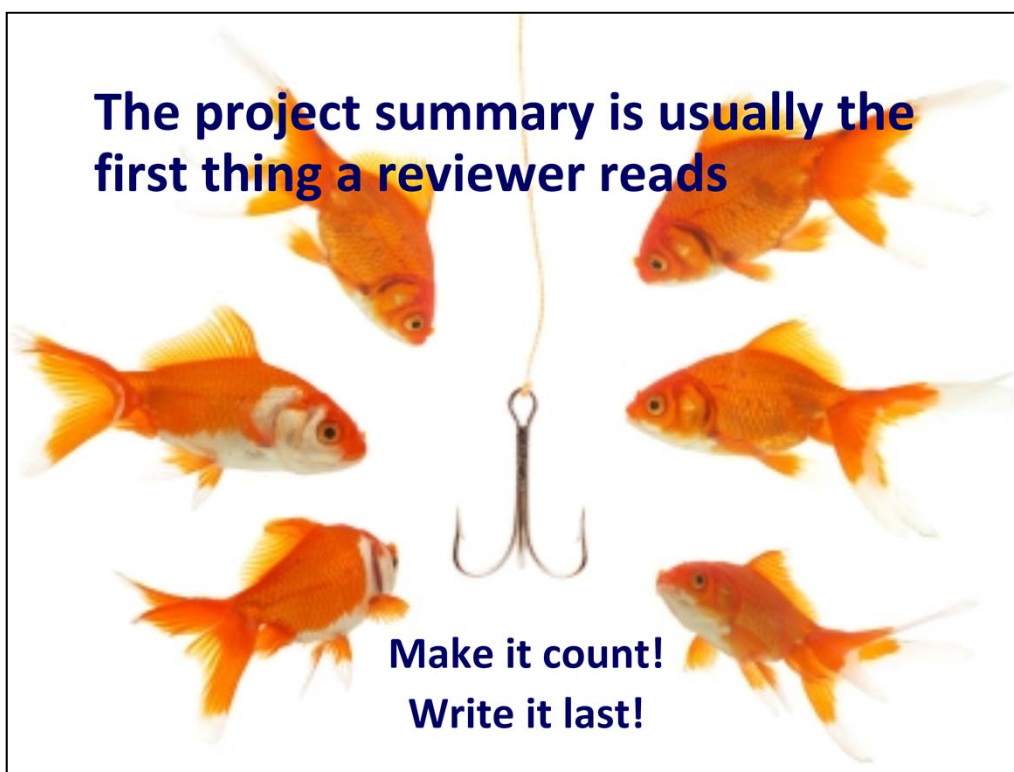
Plans for sustainability (think “business plan”)

Summary section

You are usually allowed to add some sections to the project description, provided you do not exceed the page limits for that section.

Good things to include:

1. Qualifications of key personnel—use this section to explain why your team is particularly well suited to be successful in the project. Not every reviewer will look at the biosketches.
2. A timeline—(best one may be a figure instead of narrative text)—show the reviewers that you have developed a carefully thought-out, do-able project and really know what you’re doing.
3. Specific deliverables—required reporting, attendance at PI meetings (be sure to include necessary travel in your budget), sharing of lessons learned with the community.
4. Contributions to research infrastructure at your organization, plans to share facilities with other workers, young scientists that will be trained on the project and what skills they will gain.
5. Plan B—what will you do if the proposed method doesn’t work? Show the reviewers that you’ve considered the possibility and have a back-up plan.
6. Plans for sustainability—what is your plan to ensure that the project lives on after the funding runs out?
7. Summary section—stay tuned...



A reviewer will often form a first impression of a proposal based on what's in the project summary. (You never get a second chance to make a good first impression.—Mom)

The project summary will probably be the first thing that most reviewers read, and it may be the *only* part of the proposal that some panel members (who all have equal votes) read. Make it memorable and make every word count. Do not just reproduce the first few paragraphs of the introduction to the technical section and call it “good enough.” Write the project summary last to make sure it reflects the entire proposal, as it may have evolved during the writing process.

A good project summary:

- Places the project in the context of other work—what important unanswered question is it designed to address?
- Explains the approach and persuades the reader that it will be successful.
- Anticipates likely results and explains their significance.
- Shows that funding the project will be a sound investment for the agency.
- Is understandable to a generalist.

Write like a journalist. Answer the big “W” questions in your project summary: who what, why, where, how?

Take some other tips from newspaper writing:

- Make your text scannable—break up the narrative to make important points easy to identify.
- Keep paragraphs short (three or four sentences) and limit each to one main idea.
- Make the main ideas the first sentence of each paragraph.
- Use typeface variations (bold, italic) to make important points pop off the page.

Position your important points strategically in the technical narrative



**...and make it easy for a busy reviewer
to pick them out of the surrounding text**

Position your important points strategically—at the beginning or end of sections of the proposal—that’s where people pay the most attention.

Don’t bury your most important points in the middle of long blocks of text. For maximum readability, write short sentences (<25 words) and short paragraphs (<8 sentences).

TIP: Provide an “overview” or “goals” section at the beginning of your technical narrative and a “summary” section at the end that recaps and emphasizes your key points.

Take it from a mother, stating a critical point three times is not overkill.

Use graphical highlighting—boldface or italics, bulleted lists, indents or offsets—to make it easy to pick out your main points and most persuasive arguments.

Use meaningful, content-rich headings to guide the reviewer



"Introduction"

"What we still don't know about HTSCs"

"Experimental Set Up"

"Novel Scanning SQUID Microscope"

"Broader Impacts"

"Introducing Middle Schoolers to *Nano*"

Don't use content-less headings; they're boring and they represent a huge missed opportunity. Use headings to reiterate and emphasize your most important points.

Tip: Make a list of just the headings and subheadings of your project description. Could somebody who simply leafed through that section understand what your project was about, just by reading the headings? (Some reviewers may do exactly that.)

Once you've got decent headings, make them pop off the page with graphical highlighting—**color**, **boldface**, *italics* (But don't use proscribed fonts!)

Set off the Headings with Extra White Space

Don't use ALL CAPS, however. It looks as if you're shouting, and text rendered in all caps is much harder to proofread.

Q2: What percent of research proposals submitted to NIH are funded?

- a) <15 percent**
- b) 15 percent**
- c) 20 percent**
- d) 25 percent**
- e) >25 percent**



http://report.nih.gov/success_rates/index.aspx

Number of proposals submitted in FY11—49,592 (up from 30,068 in FY02)

Number of proposals funded—8765 (down from 9396 in FY02)

Percent funded—17.7 percent (down from 31.3 percent in FY02)

Be aware of the realities of review

Reviewers are experts, and they're busy

They read proposals under less-than-ideal conditions

They are looking for mistakes, omissions, objections

They may be reading several proposals on the same topic—how will yours compare with others'?

Give the reviewers “quotable” points to help them write their evaluations



Understand WHEN and HOW proposals are reviewed.

Reviewers read them when they're jet-lagged, when they're falling asleep, when they've already read fifteen similar proposals. They may read only the project summary or the budget justification. Or they may look only at the figures.

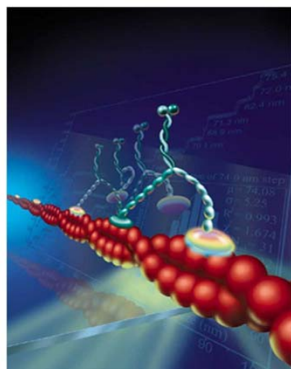
Reviews are often done by panels, and only one or two members of the panel will likely have read your proposal in any detail. Some may have read only the project summary and glanced at the budget. Some may have glanced at only the title page and scanned the figures. But all members of the panel have equal votes.

A reviewer should have general knowledge of your field but may not be acquainted with very technical details. Be sure even a non-expert reviewer can understand what you're going to do, how you're going to do it, and why it's important.

Provide “quotable” points; make it easy for reviewers to spot them and extract them to write their reviews.

Don't make reviewers think too hard or sift through mounds of information to ferret out the reasons why your project should be funded—tell them explicitly.

Use figures to illustrate your most important points



Myosin V "walking" on actin
Courtesy of P. Selvin

Figures promote reviewer interest, provide supporting evidence, help explain complex ideas and relationships quickly, and give the reviewer something to remember

Use figures to illustrate your most important points. The reviewer will be exposed to those points three times—once in the text, once in looking at the figure, and a third time when he reads the caption. Make the figures memorable—people remember visually interesting pictures far better than they remember words (q.v. any of the Edwin Tufte books; *Visual Display of Quantitative Information* should be mandatory reading for all scientists).

Use figures to draw reviewers into your story and give them something to remember.

"As for a picture, if it isn't worth a thousand words, to hell with it."

--Ad Reinhardt, American artist

Okay, what are the four reasons why you should include figures in your proposal?

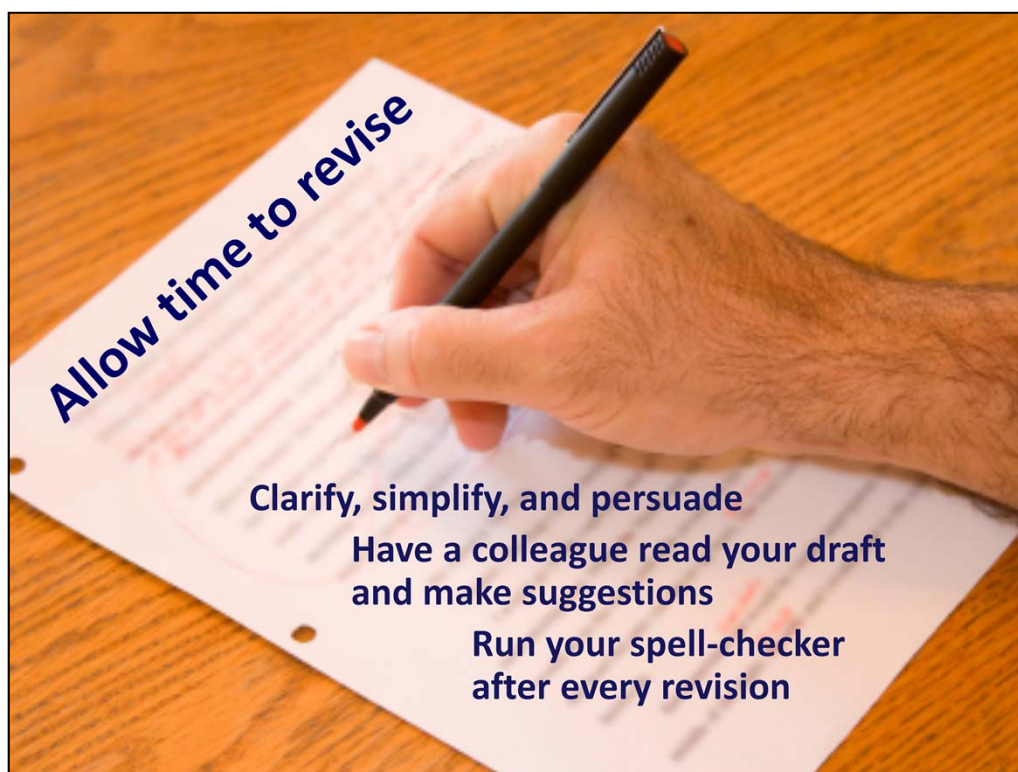
Three reasons?

One reason?

Do you remember what the image was on the previous slide?

I rest my case...

Reviewers will remember your figures—if they are clear, visually engaging, and meaningful—much longer and better than they'll remember your words.



The probability that a first draft will not require revision asymptotically approaches 0.

Brevity is a key goal. Use your revisions to **clarify** and **simplify**.

“Perfection is achieved, not when there is nothing left to add, but when there is nothing left to take away.”—Antoine-Marie-Roger de Saint-Exupery

Give yourself adequate time to reflect and rewrite.

Revising should incorporate four distinct elements:

- 1) clarifying the selection and presentation of ideas.
- 2) organizing the narrative logically and incrementally.
- 3) using language precisely and concisely.
- 4) correcting “mechanical” errors that detract from a professional appearance.

Ideally, editing should be done in three passes:

- 1) reading for content (the science).
- 2) editing for style (organization and language).
- 3) proofreading for mechanics (spelling, punctuation, grammar, usage).
- 4) If you’re not a native English speaker, get help from someone who is.

Writing well is a learned skill—read a lot (and not just journal articles), train yourself to recognize good writing, emulate good examples, and practice, practice, practice.

Never stop selling



Put every section of the proposal to work for you—biosketches, facilities, budget justification—refer the reviewer back and forth between sections

Don't make the reviewer hunt for reasons to say "must fund"

Never stop selling. Make every component of your proposal (biosketch, budget justification, facilities section, as well as the technical narrative) a persuasive statement of your capabilities to tackle the problem.

Check a hard copy printed from the portal's server

Section D. References Cited

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2. Yildiz, A., M. Tomishige
Science, 2004. **303**:
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Proc Natl Acad Sci U
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- RN YildizLAJUNMNTomishigeLRNValeLDL and PIRNSelvinLRNL *Kinesin Walks Hand-Over-Hand*.
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- SN KuralLCJHNKimLSNsyedLNGGoshimaLVINGelfandLand PIRNSelvinLKinesin and dynein move
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- TN KuralLCJHANSerpinskayaLYBNCheuLRDNGoldmanLVINGelfandLand PIRNSelvinL *Tracking*
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S ALRPPVW04HSIZpN5VWRN
- UN RohdeLCJHFNZengLRNGonzalezRubiLMNAngelLand MIFNYanikL *Microfluidic system for*
on-chip high-throughput whole-animal sorting and screening at subcellular resolution. Proc Natl
Acad Sci U S ALRPPVW04HSIZpN58Y1N
- VN HulmeLSJENLSNShkevoplyasLJNApfeldLWNFontanaLand GIMNWhitesidesLA *microfabricated*
array of clamps for immobilizing and imaging C. elegans. Lab ChipLRPVPW0H11ZpNU1UMSN
- WN KuralLCJHMLNNonetLand PIRNSelvinLFIONA on *Caenorhabditis elegans*. BiochemistryLRPPYN
48HRRZpNTVVSNN
- 8N ZhangLRJLENRothenbergLGNFruhwithLINGoldingLTNNgt.VNLopesLand PIRNSelvinL *Rapid*
Two-Photon Imaging with Nanometer Accuracy of Individual Quantum Dots in a Biological
Environment. Nature MethodsLRP1PLsubmittedN

...and don't use proscribed fonts, either

You won't know you've uploaded the budget justification in the project-summary slot unless you print out the file from the server.

I've done it all—uploaded the PI biosketch, once for the PI and the same one for the co-PI bio; had a 77-page file transfer only the first 38 pages; forgot to upload a section—the permutations of what can go wrong are endless (to first order), particularly when you're trying to do everything at the last possible minute.*

*Refer to the Elliott equation (Slide 2).

Sources of good advice and further reading...



HHMI—*Making the Right Moves: A Practical Guide to Scientific Management for Postdocs and New Faculty*

NIH—*NIH Peer Review Revealed*, Center for Scientific Review

NSF Regional Grants Conferences

Volunteer to be a reviewer!

Making the Right Moves: A Practical Guide to Scientific Management for Postdocs and New Faculty, 2nd ed., Howard Hughes Medical Institute, download or order a free copy at <http://www.hhmi.org/resources/labmanagement/moves.html>.

NIH Peer Review Revealed, Center for Scientific Review, a series of videos that gives an inside look at how NIH grant applications are reviewed; separate video on tips for applicants. <http://cms.csr.nih.gov/ResourcesforApplicants/InsidetheNIHGrantReviewProcessVideo.htm>

NSF Regional Grants Conferences are held several times a year in different parts of the country. The first 2013 conference will be in Arlington, VA. www.nsf.gov/bfa/dias/policy/outreach.jsp

One of the best ways to do market research and scope out the competition is to be a reviewer, and NSF at least is *always* looking for reviewers. Call the program officer and tell him or her that you'd like to be a reviewer and follow up with an email summarizing your research interests and areas of expertise and attach a brief CV.

To recap:

**Don't neglect other sections of the proposal
by focusing only on the technical narrative**

Ask for help

**Read the directions
(and follow them witlessly)**

Make the reviewers' job easy

Remember $t = 3H + \epsilon$!

Never stop selling, and never give up

Questions? cmelliot@illinois.edu

<http://physics.illinois.edu/people/Celia>



Remember:

Writing a proposal is an evolutionary process that comes in stages:

Getting in the mood.

Getting words on paper/screen.

Revising, revising, revising, revising, revising, revising, revising, revising,...

FINISHING BY THE DEADLINE!!!*

*Do not use too many exclamation points in your proposal!!

Reviewers will think you're a crackpot!!!!