Tips on writing research proposals

Mimi Shirasu-Hiza

Dept. of Genetics and Development

Columbia University Medical Center

"My project is my baby…"

WRONG!

The REVIEWER is your baby.

The REVIEWER is your baby.

(Psst. Your project is actually the mush on the spoon.)

I cannot write grants like a famous senior PI

- I work on circadian-regulated physiology in *Drosophila*

- My postdoc advisor was not super famous nor well-funded

- I am not senior: I got tenure in 2017

- In the last 10 years, I applied for 60 grants (including 28 trainee grants)

- I received 8 grants (the Basil O'Connor, Hirschl, Simons, 3 R01s, and a MIRA or R35); my trainees received 7 grants; and I helped 4 friends/collaborators receive 6 major grants

- 25% success rate; paylines have been 10-15% (less for NCI, NIAID)

- I know that I've been lucky!

- I served on NSF study section for two years early on and got advice from a senior TAC mentor who was on NIH study section

# Here are some tips on grant writing
from the perspective of a reviewer

- Know the review process
- Be kind to your reviewers: make your grant easy to read
- Have a writing strategy
- Develop your elevator pitch

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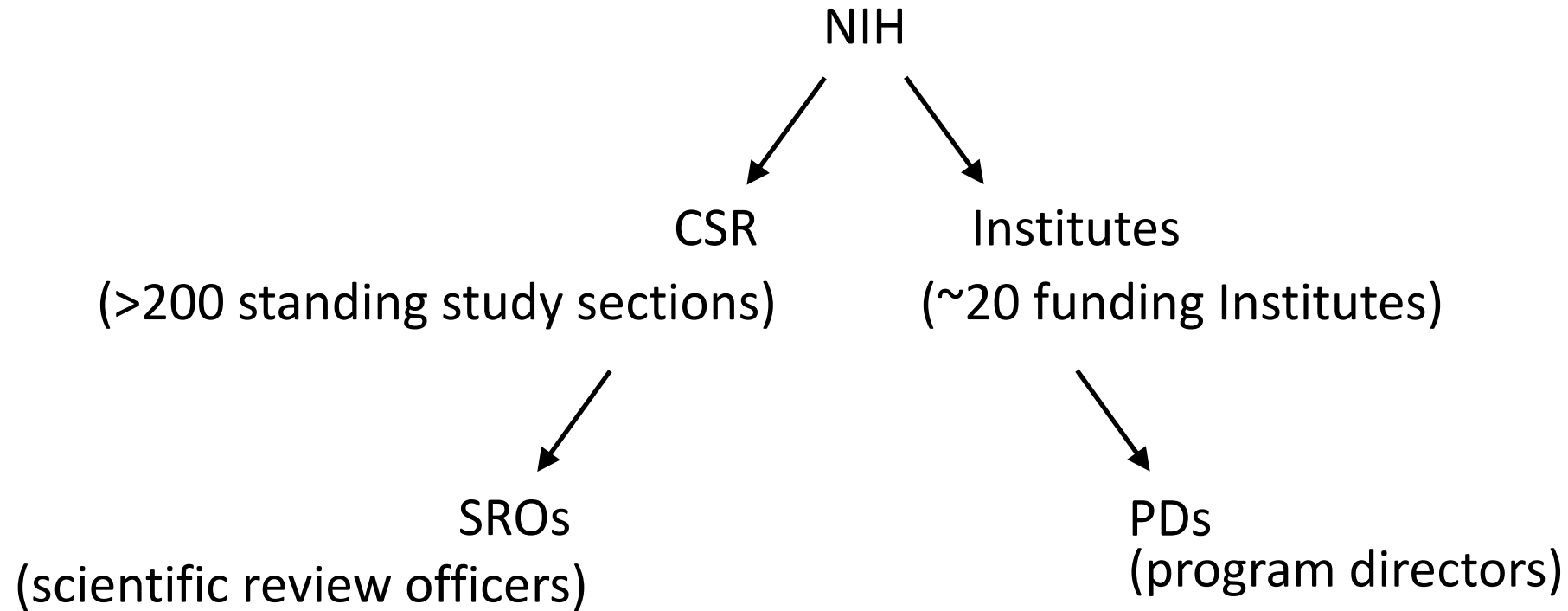- Develop your elevator pitch

The review process is time-restricted

Time spent
on statement: Being written   Being read/discussed
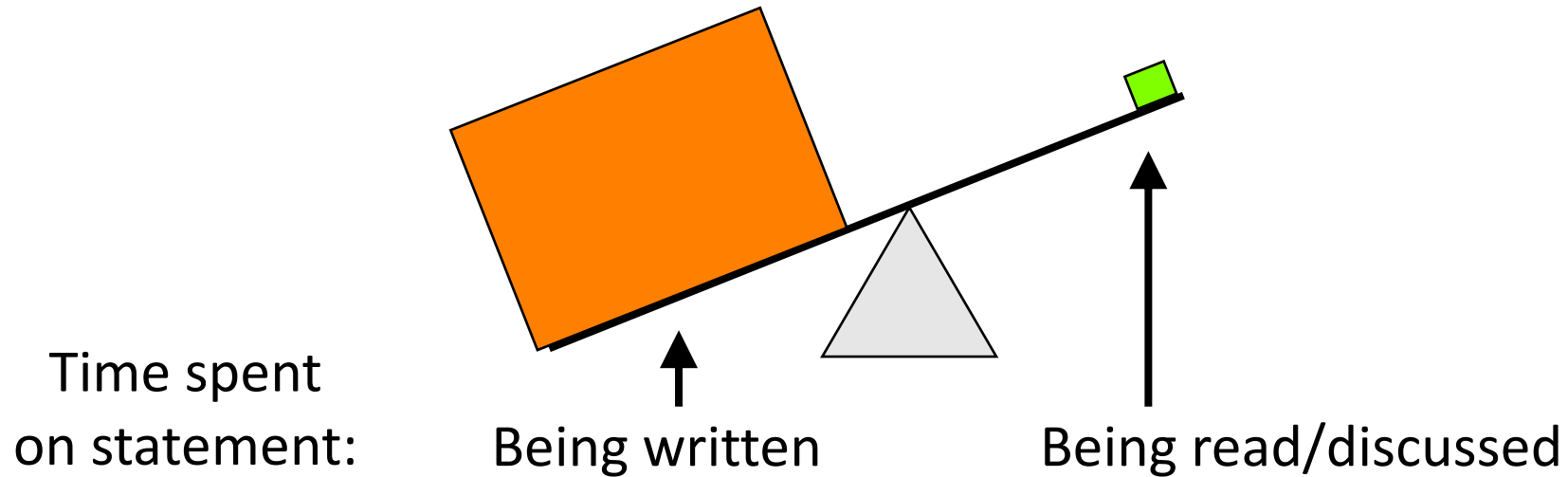
- You might spend a month or two writing your grant
- Reviewers typically get up to 10-15 grants to review per cycle
- They get a few weeks to review
- This is not their full-time job: most reviewers are also teaching, writing grants and papers, running their labs

Who is your audience?

NIH

CSR

(>200 standing study sections)

Institutes

(~20 funding Institutes)

SROs

(scientific review officers)

PDs

(program directors)

Applications are **reviewed** by the Center for Scientific Review (CSR) and **funded** by an Institute

If the CSR is a mall, then
PDs are personal shoppers for their Institute
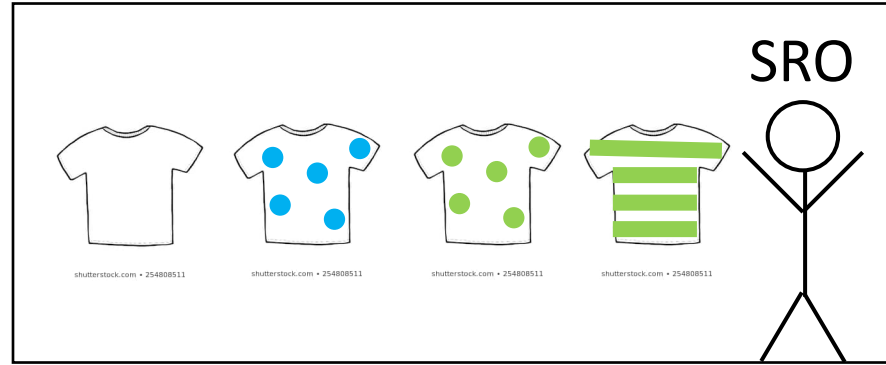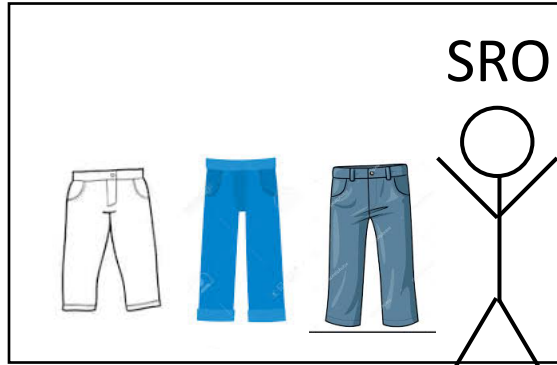
- PDs want to fill their portfolio with excellent grants that fit their Institute's mission
- Identify a PD interested in your grant and ask them for advice
- Look at different study section rosters

If the CSR is a mall, then
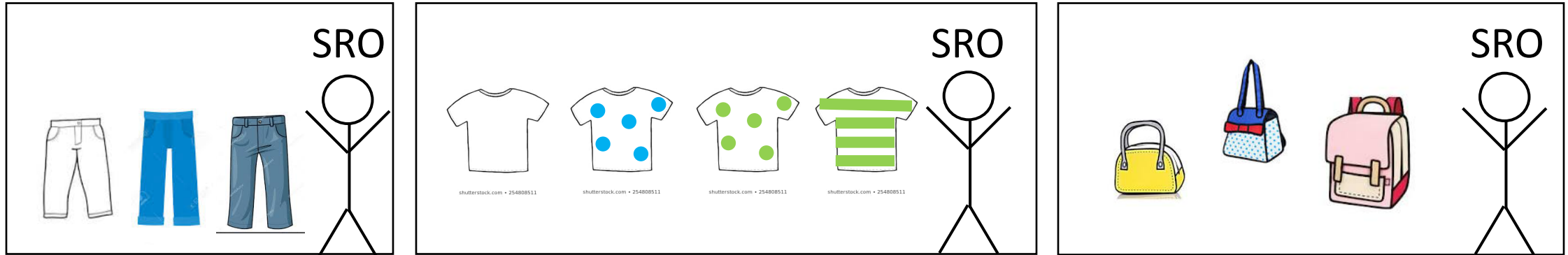# PDs are personal shoppers for their Institute

PD

- PDs want to fill their portfolio with excellent grants that fit their Institute's mission
- Identify a PD interested in your grant and ask them for advice
- Look at different study section rosters
  * If you don't recognize any of the names, this is not the study section for you!

The review process for NIH study section

- Grant is assigned to study section and Institute (NIH)
- Grant is typically assigned to 3 reviewers:
    - primary, secondary, tertiary
- Each reviewer gives preliminary impact scores and writes comments
- The bottom 50% is not discussed unless called up by a reviewer
- Primary has 4 min to discuss score drivers; secondary has 2 min to add; tertiary has 2 min to add (times can vary)
- Discussion by whole group
- Rescore and set the range
- Everyone scores
- Proposal order: either from highest to lowest prelim scores or random

Decide on an Appropriate Overall Impact Score

Overall Impact:
The likelihood for a project to exert a <u>sustained</u>, <u>powerful</u> influence on research field(s) involved.

Overall Impact	High	Medium	Low
Score	1 2 3	4 5 6	7 8 9

Evaluating Overall Impact:
Consider the 5 criteria: Significance, Investigators, Innovation, Approach, Environment (**weighted based on reviewer's judgment**) and other score influences (e.g. human subjects)

5 is a good medium-impact application, and the entire scale (1-9) should always be considered.

e.g. Applications are addressing a problem of <u>high</u> importance/interest/significance in the field. May have some or no technical weaknesses.

e.g. Applications may be addressing a problem of <u>high</u> importance in the field, but weaknesses in the criteria bring down the overall impact to medium.

e.g. Applications may be addressing a problem of <u>moderate</u> importance in the field, with some or no technical weaknesses

e.g. Applications may be addressing a problem of <u>moderate</u>/<u>high</u> importance in the field, but weaknesses in the criteria bring down the overall impact to low.

e.g. Applications may be addressing a problem of <u>low</u> or <u>no</u> importance in the field, with some or no technical weaknesses.

What are "score drivers"?

- ONE overall score from 1-9

- Typically, there are FIVE score drivers (overall score is NOT an average):

  - Significance: is this a big problem?

  - Investigator: are you going to be able to do these experiments?

  - Innovation: is this work going to advance the field or is it incremental?

  - Approach: what is your Great Idea and how will you test it?

  - Environment: does your environment support you?

- Additional review criteria (non-scored items): vertebrate animals, biohazards, resub/renewal/revision

- Early career reviewer (ECR) program: https://public.csr.nih.gov/ForReviewers/BecomeAReviewer/ECR

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Remember the review process!

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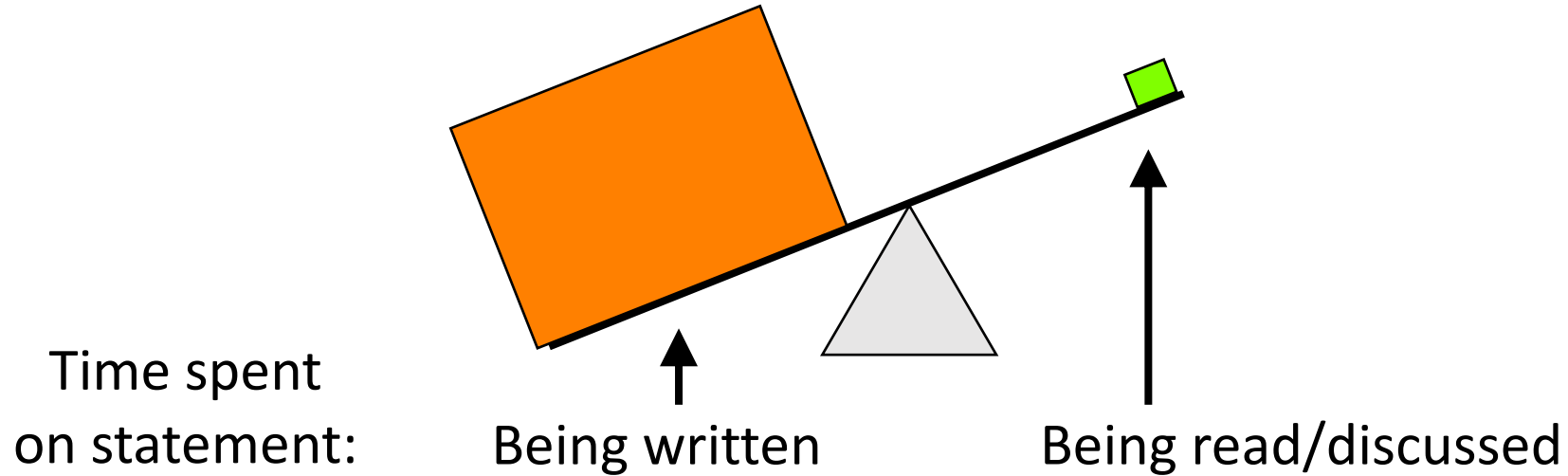
- Write for skimmers
- Please make it EASY TO READ
- Highlight what they need to write their reviews
       (significance, investigator, innovation, approach, environment)
- If they miss it: unfortunately, it's YOUR fault

How do you write for reviewers?

- Edit your story

- Write for someone who is NOT in your field

- Make the text easily reviewed <u>at a glance</u>

- Use the first/last sentences

- Don't reverse the logic

- Use short sentences and simple language

- Use the last part of the sentence to emphasize your points

- Make your figures simple and easy to understand

Edit your story

- ONLY give us the information we need to understand the proposal
    - don't write a review of the field
    - don't tell us about your journey

What actually happened

What goes in the prelim data
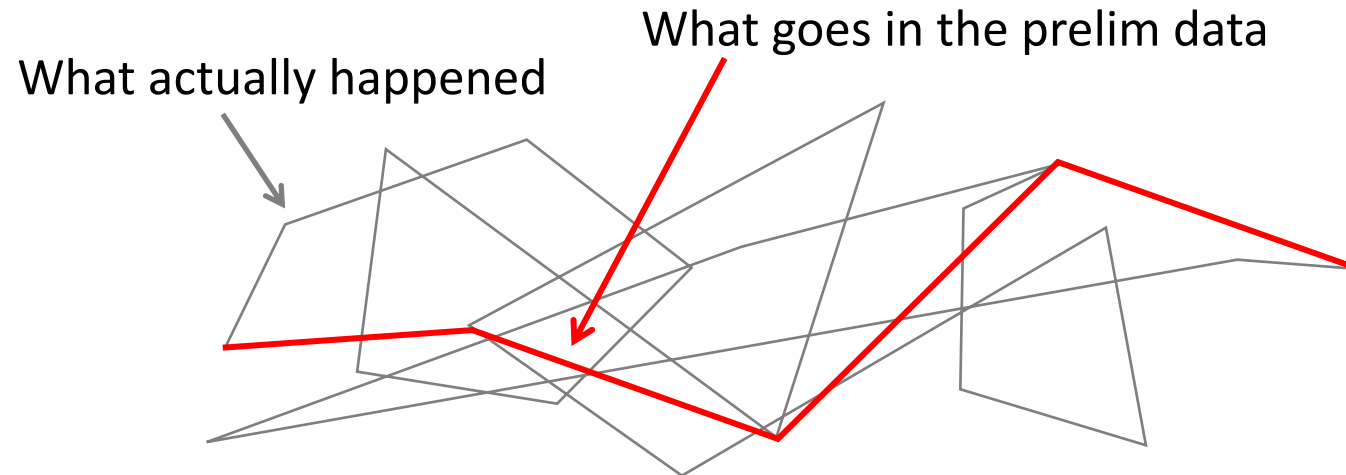
    - don't give us too many caveats
    - don't trash your colleagues; don't brag

- Show, don't tell

Write for someone who is NOT in your field

- Use acronyms sparingly!

- Provide basic definitions

- Do not assume that the reviewer is an expert

- Pass your grant through a smart colleague in a related field

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Please do NOT serve me alphabet soup!

"We will examine the role of defects in HRR, specifically DSB repair, exacerbated by the TME, in DIG using HTS and snATAC."

Make the text easily reviewed <u>at a glance</u>

- Organize your thoughts
  - start with an outline!

- Use **bold and white space**

- Reviewers have to hit specific points: make it easy for them
  - Innovation: make that a section
  - Alternative strategy: <u>underline</u>
- Make it obvious to the reviewer where they are
  - use headings and outline form
- ONE major point per paragraph
  - think about what point you are trying to make

Use the first and last sentences

- The first (or second) sentence should be a TOPIC SENTENCE
  - This is the main point of the paragraph
  - Everything in the paragraph should support the topic sentence

- The last sentence should give us the take-home message and transition into the next paragraph
  - Ideally, it is more than just a summary

- Skimmers really only read the first and last sentences

Topic   Take-home
sentence   message

Don't reverse the logic too many times

- Refrain from too many
    But… however… not… except…

- Try to keep it positive!

- Use the "While… not…" construction

- Use parallel construction

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- Use parallel construction

"Dietary components affect an organism's metabolism; however, it is not clear if the timing of feeding does not have an equally important impact on energy consumption and usage."

"While it is known that dietary components affect metabolism, it is not known how dietary timing affects metabolism."

Use short sentences and simple words

HALVE your sentences: One or two words will often be clearer than three or four. Don't use too many clauses or prepositions.

Instead of:
"In order to elucidate which different amino acids are required for survival of infection, we first looked at the effect of changing dietary amino acid concentration."

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Try:

identify

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For:

"To identify amino acids required for survival of infection, we varied dietary amino acid concentration."

Use short sentences and simple words

- Use active voice as much as possible

    Passive voice examples:
    "It was heard by me through the grapevine."
   "Mistakes were made."

- Use simple verbs

- Use the same words/phrases to describe your biology so it sticks in our heads

    Don't use "cytokinetic variation" and "variation in cytokinesis" and "cytokinetic diversity" and "cell-specific cytokinesis": Pick one!

Some general tips on verb tense:

• Ideas previously published or currently accepted in the field (that you are not disputing) are in PRESENT tense: "There are three well-characterized immune mechanisms in Drosophila."

• General protocols are described in PRESENT tense: "To quantify phagocytic activity in vivo, we typically perform the following assay."

• Experiments and results that you performed and obtained are described in PAST tense: "We found that these mutants had increased phagocytic activity relative to wild-type controls."

• Your thoughts and conclusions suggested by results are in PRESENT tense: "This result suggests that this mechanism inhibits phagocytic activity."

• Describe results as "XYZA": To test X, we did experiment Y and got result Z; this suggests A.

Figures for grants need to be simple enough to understand at a glance

Fig. 3: Male *per* mutants (green) live longer than controls (gray). p-value by log-rank analysis.
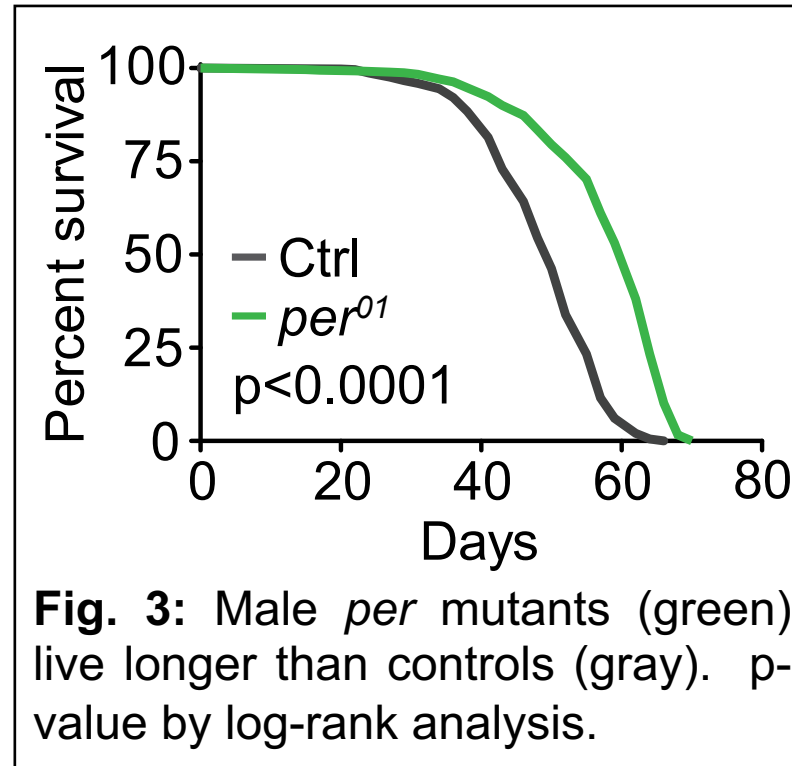
- Use minimal text in a readable font size

To emphasize points, use the "stress position"

Prof. George Gopen at Duke University highlights the position next to the period (or colon or semicolon) as the "stress position".

In this paragraph, find the important phrase:

As used in the foundry industry, "turnkey" means responsibility for the satisfactory performance of a piece of equipment in addition to the design, manufacture, and installation of that equipment. P et al. agree that this definition of turnkey is commonly understood in the foundry industry.

To emphasize points, use the "stress position"

The <u>underlined phrases</u> are in the stress position; but they are not the important phrases.

The important phrase is in **bold**.

As used in the foundry industry, "turnkey" means responsibility for the **satisfactory performance** of a piece of equipment in addition to the design, manufacture, and installation of <u>that equipment</u>. P et al. agree that this definition of turnkey is commonly understood in the <u>foundry industry</u>.

To emphasize points, use the "stress position"

To rewrite this paragraph, put the important phrase in the stress position:

"satisfactory performance"

As P et al. agree, the foundry industry uses the term "turnkey" to signify responsibility not only for the design, manufacture, and installation of a piece of equipment but also for its satisfactory performance.
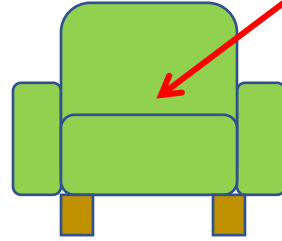
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Some general writing tips:

- Designate a good time and space, away from distractions

- Figure out your most efficient time of day for writing
- Start each section as a new document!
- Break up each task into sub-tasks and start with easy stuff
- Find a buddy
- Give yourself permission to do a vomit draft
- Get feedback from someone outside your field/lab

This is the way I (typically) write a grant

1. Make Dropbox with pre-set folders for required documents
   - plus a "Submit" folder to share with your pre-award core representative
2. Make a schedule with excel
3. Start with "partses 1"
   - letters of support, biosketches
   - facilities, equipment, resource sharing, vertebrate animals, hazards, etc.
4. Research statement (specific aims, significance, prelim data, aims)
   - new document (vomit draft) for EACH SECTION (~1 week per section)
5. Edit: find topic sentences; move sentences to beginning/end of paragraph; cut words; clarify phrases
6. Figures, including graphic schematics
7. Stitch together and give to readers; incorporate comments
8. Deal with "partses 2": ancillary research stuff (refs, narrative, summary, etc.)
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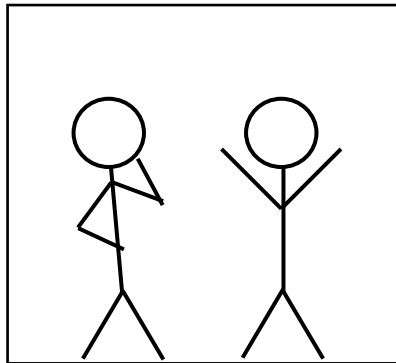9. Label folders DONE and move docs to Submit folder

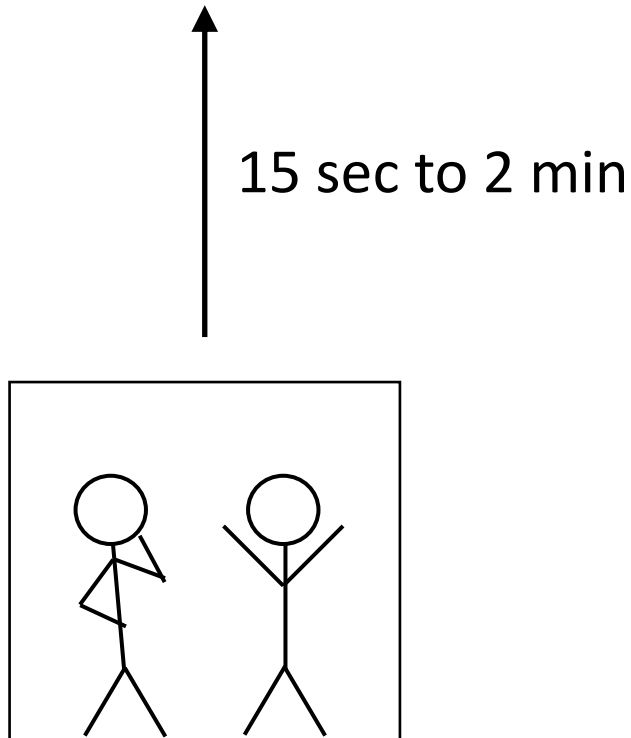# Here are some tips on grant writing from the perspective of a reviewer

- The review process

- Writing a research statement that is compelling, concise, and clear

- Writing strategy

- Developing your elevator pitch

Writing a grant is simply
an ELEVATOR PITCH

15 sec to 2 min

What's in a pitch?

15 sec to 2 min

The Pitch has to tell me:
- What is the problem?
  - (gap in knowledge, significance)
- What is your solution?
  - (your Great Idea--approach, innovation)
- And why should I pay <u>you</u> to do it?
  - (investigator, environment)

You must <u>hook</u> the reviewer and <u>persuade</u> them to invest over a <u>million</u> dollars in you and your idea

The elevator pitch is your SPECIFIC AIMS PAGE... want to learn more?
See you in November!