

Grant writing.

- **Basic concepts and how to tackle getting it done**

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| **AERD Center** |



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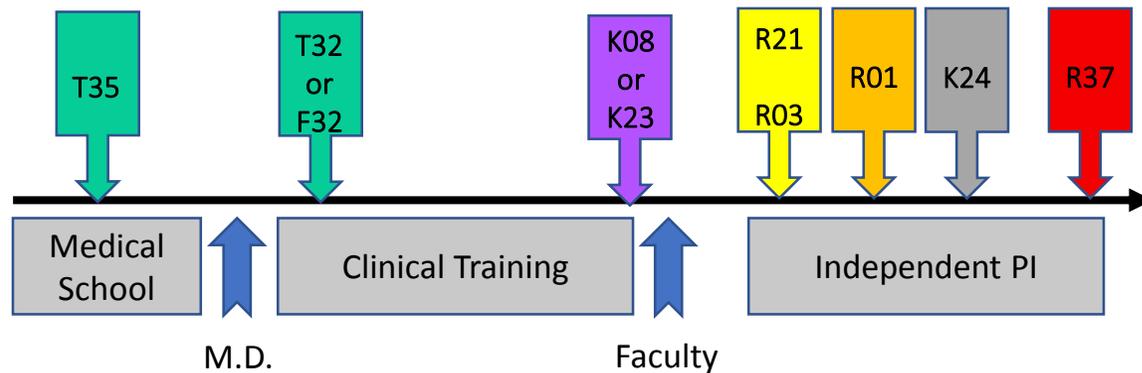
General Principles (advice from Josh Boyce)

- Academic career paths of all descriptions require some degree of grant funding to support research activities (get used to it)**
- Competition is steep (be bold and have a thick skin)**
- Be alert and seize opportunities (the only grant you cannot get is the one you don't apply for)
- Grants vary in size, scope, structure and purpose but there are commonalities to all successful applications (NIH format is often used as the prototype)
- An application can be reconfigured to apply to multiple sources (be entrepreneurial)

***I'm not sure you ever really get used to it.*

Research Grants at NIH

- K08: Mentored Career Award for hypothesis-driven benchwork (5y, 90-100k salary + ~50k in supplies)
- K23: Mentored Career Award for patient-oriented research (5y, 90-100k salary + ~50k in supplies)
- R01: Research Project Grant for established investigators (4-5y, 250-500k per year)
- R21: Exploratory Developmental Research Grant Program
- R03: Small Research Grant Program
- K24: Mid-career Investigator Award in Patient-Oriented Research
- R37: Merit Award



- T32
- AAAAI 3rd/4th Year Fellow Award
- K23
- Mast cell foundation
- AACRC (U19)
- R01
- Mentee K23
- AACRC (U19) #2
- GSK-sponsored IIS
- Regeneron-sponsored IIS
- Mentee K23

*A little about my grant history (successes and failures **)*

***I'm still not used to it*

Basic components of a grant

- A central theme (e.g., why basophils are important in Th2 responses; why allergens are allergens, why do inner city asthmatics have more severe disease, etc) – *this could also be framed as a central question*
- A central hypothesis – *could be framed as an answer to your question*
- A set of Specific Aims (objectives)
- A description of how the Aims will be accomplished (approach)
- A description of what will be learned as a result and why it is important
- A description of what will be done if the initial approaches fail
- A career development and mentoring plan and evidence for institutional support (for K awards)
- A budget

When to apply for a K award?

Begin thinking/planning as early as possible with your mentor.

Successful candidates must have:

- Publications directly related to the subject matter
- A mentor with a track record of successful training, expertise in the area, and R01 or equivalent funding
- A good idea, a clear hypothesis, solid preliminary data, and well thought-out Specific Aims
- A well thought-out career development plan, including milestones and timetable

When to apply for an R01 award?

Begin thinking/planning during first 2 years of K, plan to apply in years 3-4.

Successful candidates must have:

- Productivity directly related to the subject matter (goal should be 1 first/senior authored paper/year in a top journal)
- Evidence of separation from mentor
 - At least 1 or 2 papers published without him/her
 - Work proposed can be related to mentor's work but not duplicative
- A good idea, a clear hypothesis, solid preliminary data, well thought-out interrelated Specific Aims, **Significance**, and **Innovation**

Once you know (sort of) what you want to write about, and a mentor has told you that you are in a good position to submit a grant...

Give yourself 6 months.

Writing, re-writing, editing, realizing you need one more key piece of preliminary data... it takes a while.

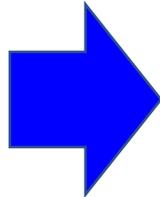
Step 1. Figure out which grant(s) to apply for

- Try to find at least two funding mechanisms for which you can use the same ideas/grant.
 - NIH + DOD
 - NIH + Foundation grant or Institutional grant
 - NIH + Industry (IIS = Investigator-Initiated Study)
- <https://www.grantforward.com>
- https://oedb.org/ilibrarian/100_places_to_find_funding_your_research/
- <https://report.nih.gov/> - click on RePORTER

Step 2. Download all of the RFA documents and make a *DETAILED* list of everything you need to include

- 153 page SF424 (R&R) for NIH...

1. Specific Aims page
2. Research Strategy
3. Project Summary
4. Project Narrative
5. Resource Sharing Plan
6. Protection of Human Subjects
7. Planned Enrollment Report
8. Inclusion of Children
9. Inclusion of Women and Minorities
10. Equipment
11. Facilities and other resources
12. Cover letter?
13. Budget justification
14. Bhattacharyya letter of Collaboration
15. Boyce letter of support?
16. Raychaudhuri Co-Investigator letter
 - a. Raychaudhuri CV
 - b. Raychaudhuri Other Support
17. Lederer letter of Collaboration or co-investigator?
18. Laidlaw CV
19. |



1. *Specific Aims page*
 - a. *Done and PDF on 2017-09-26*
2. *Research Strategy*
 - a. *Done and PDF on 2017-09-26*
3. *Project Summary*
 - a. *Done on 2017-09-12*
4. *Project Narrative*
 - a. *Done on 2017-09-08*
5. *Resource Sharing Plan*
 - a. *Done on 2017-09-12*
6. *Protection of Human Subjects*
 - a. *Done on 2017-09-08*
7. *Planned Enrollment Report*
8. *Inclusion of Children*
 - a. *Done on 2017-09-12*
9. *Inclusion of Women and Minorities*
 - a. *Done on 2017-09-12*
10. *Equipment, done and PDF on 2017-09-22*
11. *Facilities and other resources, done and PDF on 2017-09-22*
12. *Cover letter?*
13. **Budget justification, done and PDF of 2017-09-22**
14. *Bhattacharyya letter of Collaboration*
15. *Boyce letter of support?*
16. *Raychaudhuri Co-Investigator letter*
 - a. *Raychaudhuri CV*
 - b. *Raychaudhuri Other Support*
17. *Lederer letter of Collaboration or co-investigator?*
18. *Laidlaw CV*
 - a. *Done on 2017-09-22, with PDF*
- 19.

FORMS VERSION E SERIES

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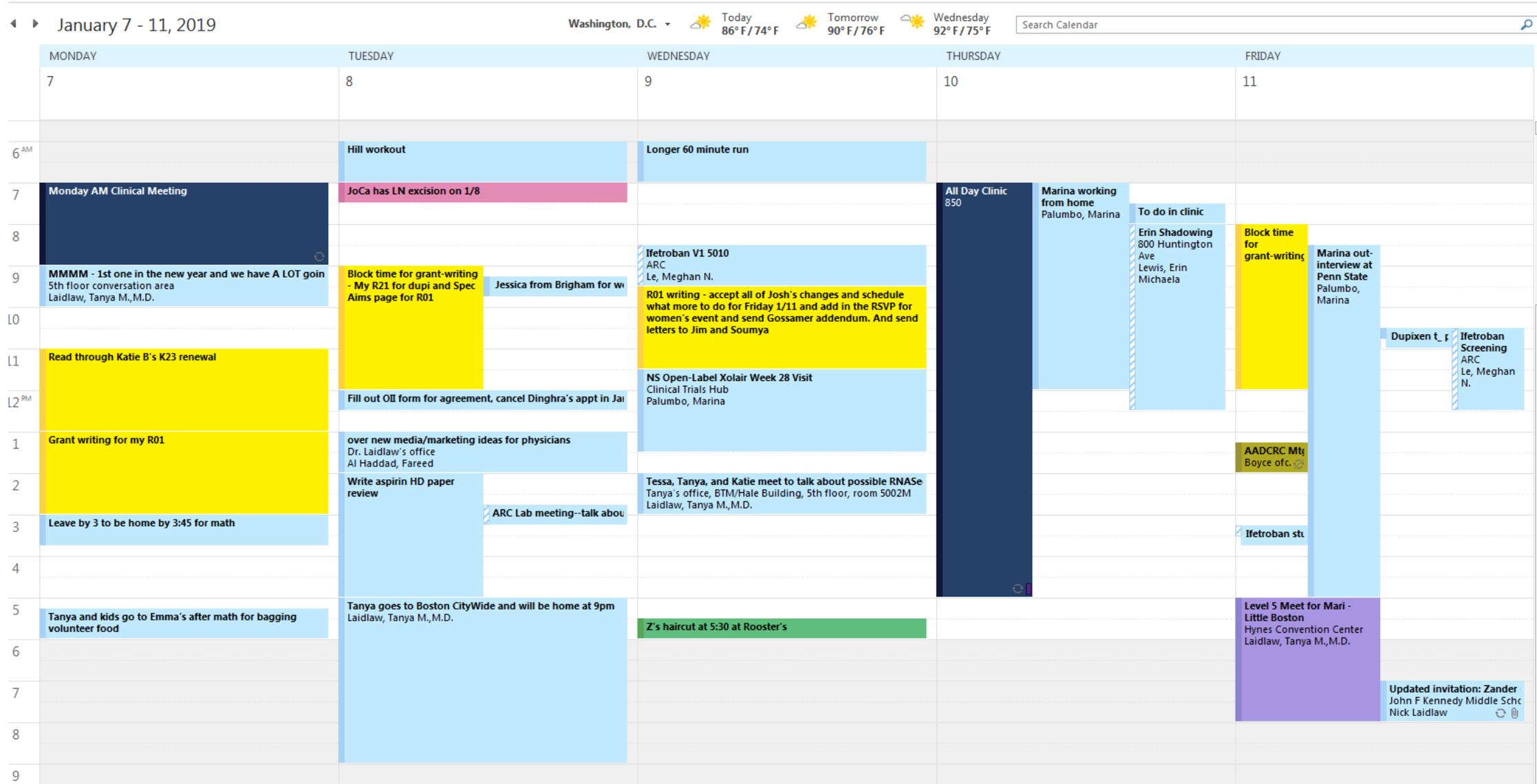


RESEARCH INSTRUCTIONS FOR NIH AND OTHER PHS AGENCIES

SF424 (R&R) APPLICATION PACKAGES

Guidance developed and maintained by NIH for preparing and submitting applications via Grants.gov to NIH and other PHS agencies using the SF424 (R&R)

Step 3. Put a *DETAILED* calendar invite/schedule for the entire timeline of writing the grant



Step 4. Ask colleagues for their old grants – many parts can be cut-and-pasted, and get a sense of style

- Before you start writing...
- Don't reinvent the wheel for:
 - Facilities and other resources
 - Equipment
 - Inclusion of Children
 - Resource Sharing plan
 - Parts of Protection of Human Subjects

Read Specific Aims pages and Research Strategies from several colleagues (both junior and senior faculty).

Writing styles differ – get a sense of yours.

Step 5. Start writing.

- Make a Word doc for each separate section of the grant, with instructions and word/line/page requirements at the top.
- Generally start the whole process with the Specific Aims page.

Specific Aims page from Twitter. [@azfaust](https://twitter.com/azfaust)

<https://threader.app/thread/1108838971159777301>

- 1st: Write down your question on the page. This is the end of the first SA paragraph.
- 2nd: Then write down your hypothesis. This will be the end (or near the end) of the second paragraph. You now have 2 lines on the page.
- 3rd: Use your question to put together the introductory paragraph – the point of the intro paragraph should be to lead the reader to your question.
- 4th: Use the question to transition to the second paragraph. The first ends with the question, the second starts with what we currently know about the possible answers to this question. Two sentences.
- 5th: Then add 1-2 sentences explaining what are the remaining gaps in knowledge or why the previous work has been insufficient. Then allude to your preliminary data to lead to your hypothesis.

Now you have 2 paragraphs that introduced your question and stated your hypothesis.

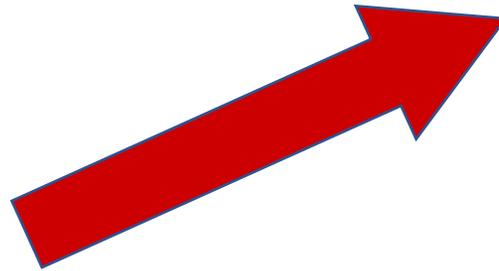
Specific Aims page from Twitter. [@azfaust](#)

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- **Aims**. Use words like determine, identify, define.
 - Don't use words like explore, describe, observe.
- 2 aims for small grants, 3 for standard grants. Never 4 aims.
- When stating the aim, tell the reader HOW you will do what you will do.
 - “I never did get the point of stating the Aim title followed by the Aim hypothesis. They are the same thing! Just get rid of the title, make the hypothesis the title, then tell them what you will do in each aim.”
- End with an impact paragraph. Tell them why this is important to do.
 - This is the part where you make a pitch for your primary institute too - if you are trying to end up in NIAID as opposed to NCI, talking about cancer in the last paragraph is not a good idea.

Anatomy of a Specific Aims page from Twitter:

<https://threader.app/thread/1108838971159777301>



What is a graphical abstract?

In the first paragraph, introduce the area. What problem are you trying to tackle? End this paragraph with the question you will answer in the grant.

Figure: Graphical abstract

Introduce the possible answers (past work), gaps in knowledge, then end with your hypothesis.

Transition to experimental approach: how will you test your hypothesis?

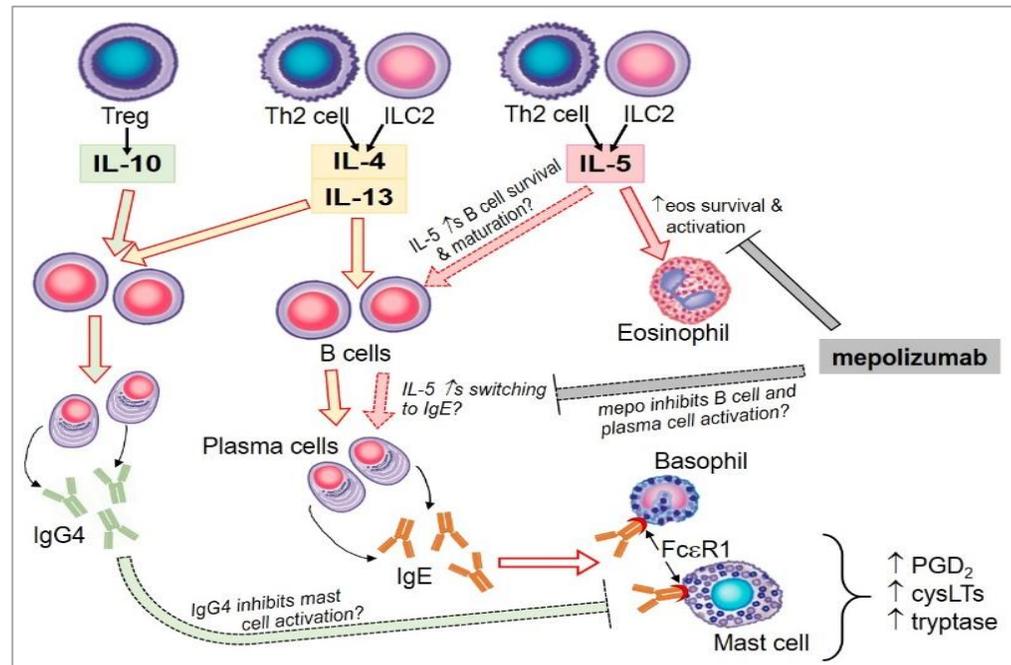
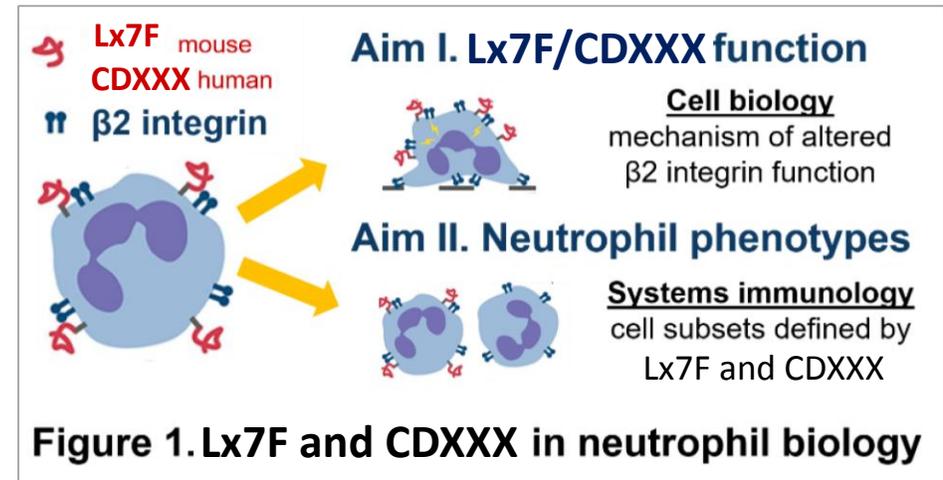
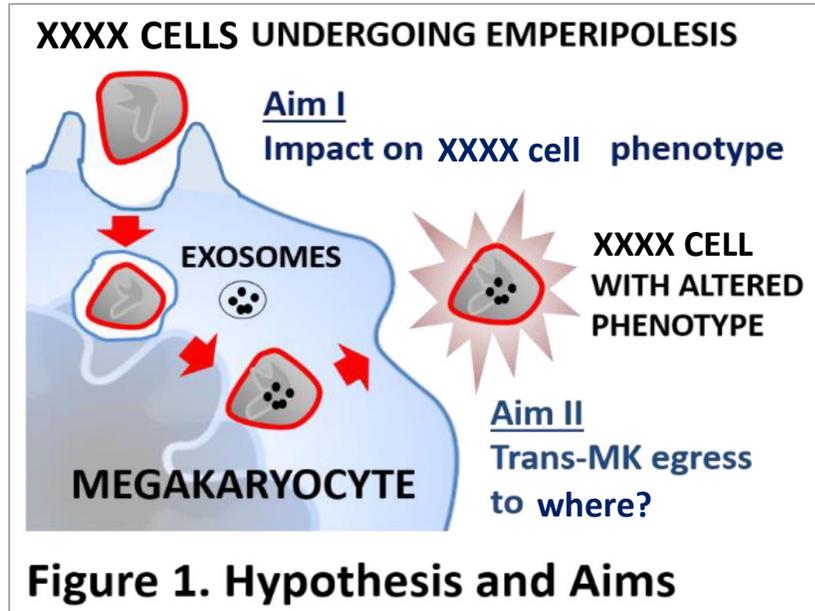
Aim 1: What will you do and how?

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Impact paragraph: tell the reader why what you are doing is important.

Graphical Abstract examples for Specific Aims page



Who will review my grant?

- Peer review system at NIH is organized into committees with focused expertise (Study Sections)
- Study Sections are composed of NIH-funded scientists who volunteer to review grants and meet three times/year to discuss
- Study sections are organized under the **Scientific Review Branch** (separate from the Institute's program officers)
- A **Review Administrator** will assign your grant to a study section based on its title and its abstract (thus keywords critical to getting into the most appropriate study section) ---- <https://art.csr.nih.gov/ART/selection.jsp>
- A **Scientific Review Officer** (person in charge of the study section) may call in ad hoc reviewers to join the committee if there are grants for which expertise is lacking (check study section rosters)

How does a study section work?

- Generally 3 meetings/year (coinciding with 3 deadlines for grant submissions)
- Each grant is assigned three reviewers (primary, secondary, and “reader”)*
- Each reviewer submits a preliminary score (before the meeting)
- Averages of preliminary scores calculated and used to triage (weed out) grants with no chance; these do not get discussed further
- All remaining grants are discussed among primary, secondary, and tertiary reviewers
- All non-conflicted Study Section members vote, even though many (most) will not have read the entire grant (reviewer’s comments and discussion are critical!)
- Score is conveyed electronically to applicant (generally 7-10 d after meeting); critique (summary statement or “pink sheet”) is available within 4-8 weeks
- K applicants are permitted to resubmit multiple revisions; must address all reviewer’s comments/concerns . R applicants are allowed one resubmission

*remember that reviewers have a pile of grants to review aside from yours. Make yours stand out!

Scoring of individual review criteria

- 5 “core” criteria for most types of grant applications
- Core criteria for K applications:
 - Candidate
 - Career Development Plan/Career Goals
 - Research Plan
 - Mentor(s), co-mentors, and collaborators
 - Environment (including institution’s commitment to candidate)
- For R01 applications:
 - Significance
 - Investigator(s)
 - Innovation
 - Approach
 - Environment
- 9-point scale (**1 = exceptional, 9 = poor**) is used for the five “core” review criteria.
- Overall impact score is NOT an arithmetic mean of the core criterion scores (one weak core criterion can sink the whole thing)

Paylines – what score gets you funded?

- Determined each year based on anticipated budget for each institution
- Initial paylines (issued at beginning of FY) almost always less favorable than final paylines (end of FY)
- K applications funded based on score cutoff
 - (e.g., 18 for NIAID, 32 for NHLBI) rather than a percentile; differ by institute (note; overall success rates for NIAID and NHLBI are similar despite disparity in payline)
- R01 applications funded based on a percentile criterion that favors early stage investigators (ESI) (i.e., first-time R01 applicants)
 - (e.g., in FY2018, NHLBI funded ESI at 25th centile; established investigators at 15th centile. NIAID was 17th and 13th)
 - As with K awards, success rates at NIAID and NHLBI for R01 applications are essentially the same.

Ways to tank your grant

- No question you are trying to answer, or no hypothesis about what the answer will be
- Unproductive applicant/investigator – best to have published something in this area first
- Thematically unrelated Specific Aims
- Superficial or entirely descriptive studies – best to have solid preliminary data to justify each aim and establish your credibility
- For K applicants, a mentor lacking current support or weak environment
- Unclear significance – why is this important?

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- Happy to send you sample applications.
- Happy to read your applications and offer feedback.
- Happy to chat through your own career trajectory and research ideas and help brainstorm grant ideas.