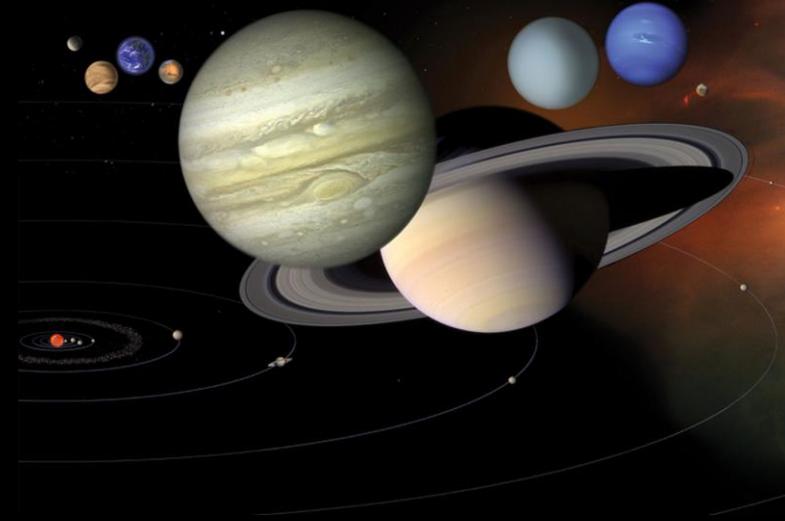


# Workshop on Proposal Writing: Using NASA ROSES as an example



**Organizer: Christina Richey,  
Jet Propulsion Laboratory**

**We appreciate support for this (and  
other upcoming workshops) from the  
NASA TWSC Program!**



**Jet Propulsion Laboratory**  
California Institute of Technology

# Logistics

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- Workshop is intended to be interactive
  - You are encouraged to ask questions, voice opinions and share your experiences
  - Get to know your fellow participants; extend your network!
  - please note anything that strikes you (good or not so good) during the workshop
  - complete a short questionnaire at the end of the workshop

## Please Answer the Following Questions in 30 Seconds or Less

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- Your name?
- Your organization?
- How much proposal experience have you had?
  - **Lots**
  - **Some**
  - **None**
- What types of proposals have you worked on?
  - **Mission**
  - **Instrument**
  - **Science/Technology**
- What was/is your most recent proposal?



# Proposal Lifecycle

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# What does the NASA Science Pot of Money Look Like?

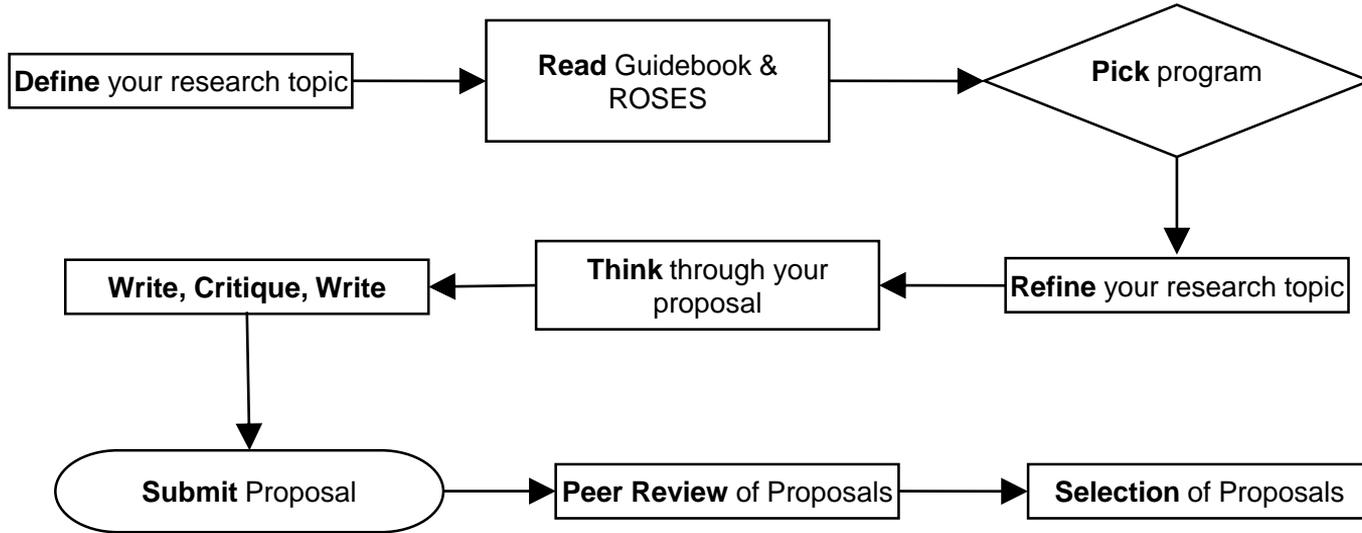
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- NASA is the premier funding agency for Earth and Space Science research
  - ~\$600M annual R&A budget with >50 R&A programs
  - Each program has anywhere from \$1M-\$15M available each year
- NASA's science research programs are managed by the Science Mission Directorate (SMD, led by the AA), which has 4 science divisions (led by the DDs)
  - Earth Science, Heliophysics, Astrophysics, and Planetary Science
- All NASA R&A funding is offered through the Research Opportunities in Space and Earth Science (ROSES) NRA
- ROSES is divided into two parts
  - Summary of solicitation
    - describes the overall opportunity and gives proposal and submission information
  - Appendices
    - one per division plus cross-division listing all programs

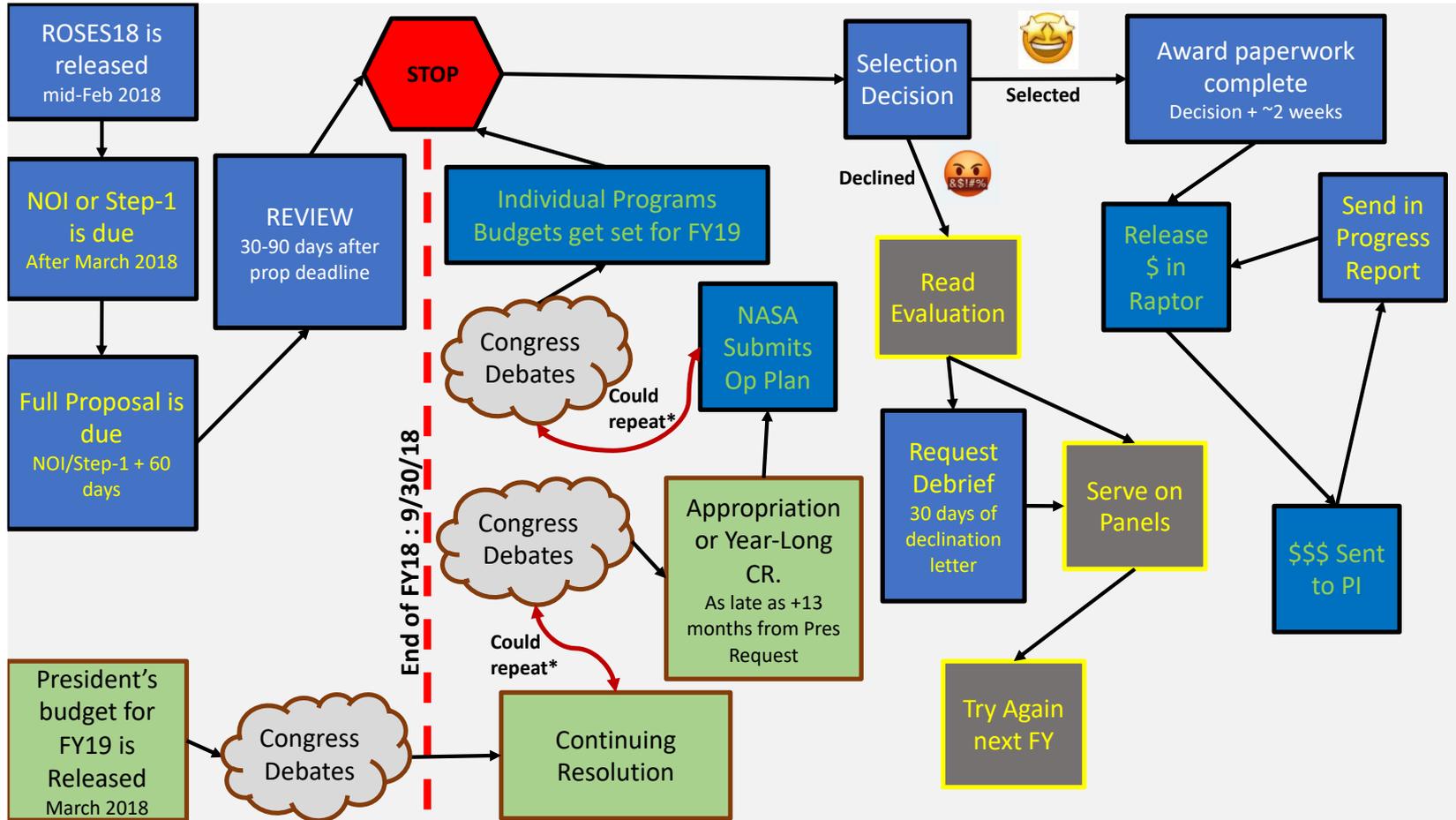


# The Process...ish

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# How Your Money Gets to You (FY19 as an example)



# Proposal Writing Guidance

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# Managing Expectations

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## What **will not** happen:

- You **will not** write a great piece of literature
- You **will not** definitively answer the grand question plaguing the community
- Your audience **will not** review your proposal in a quiet, uninterrupted setting
- Your audience **will not** be world experts on your topic
- Your audience **will not** accept your approach without question

## What **will** happen:

- You **will** write a focused, no frills document
- You **will** answer a focused, well-posed question of limited scope
- Your audience **will** quickly review your proposal amid the chaos of their own life
- Your audience **will** be colleagues from similar fields
- Your audience **will** be skeptical and critical

# Managing Expectations

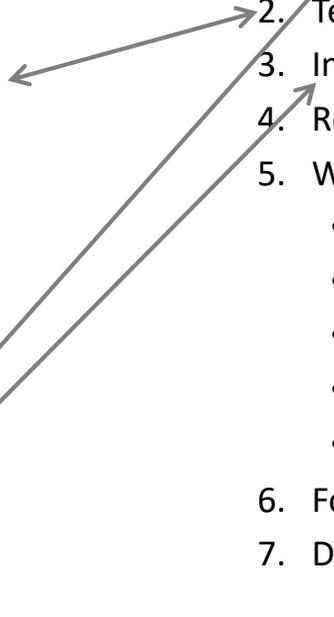
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## Typical Technical Report Body

1. Introduction
  - Background—what led to research
  - Current state of knowledge—literature review
2. Technical Approach and Methodology
  - What was done and how
  - Research or analysis methods used
3. Results and Discussion
  - Narrative of results
  - Interpretation of results based on facts and theory
  - Discussion of competing theories
4. Conclusion
  - Impact to state of knowledge
  - Expected significance

## Typical Proposal Body

1. Objectives, Expected Significance
  - Objectives
  - Expected significance
2. Technical Approach and Methodology
3. Impact to State of Knowledge
4. Relevance to Objectives in Call
5. Work Plan
  - Key milestones
  - Management structure
  - Contributions of PI, other personnel
  - Facilities
  - Risk management (if applicable)
6. Foreign Participation (if applicable)
7. Data Sharing (if applicable)



# Know Your Vision

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- Have a vision of work you would like to do
  - Target your work/proposal to the appropriate call—***be responsive***
  - Don't find a call and figure out what to propose—just to get funding
- Proposal writing is a long-term process
  - ***Your reputation*** is made by how well you deliver on every proposal you write and win (or lose)
- Proposal writing involves more than *writing*
  - ***Serve*** on committees (be a reviewer!)
  - ***Chair*** special sessions at meetings
  - ***Publish*** papers
  - ***Work*** with program managers
  - ***Participate*** in and/or convene relevant workshops (and then follow up with a report that can be cited)

# Know the Context

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- **Read** the *Call for Proposals* carefully
- **Understand** the *programmatic relevance* of your idea
  - What NASA missions will the proposed work make cheaper, better, or possible at all?
- Use National Academy reports, conference reviews, NASA Strategic Plans, Roadmaps for **guidance**
- **Ask** colleagues, supervisor, scientists, Directorate program scientists and technologists for help

# General Guidance

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- Organization is key!
- Follow the Guidebook for Proposers Tables and Instructions
- Use the SARA website: <https://science.nasa.gov/researchers/sara/faqs/>
- Provide clear signposts throughout the proposal



# Generic Outline

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1. Title
2. Abstract
3. Introduction
4. Problem Statement and Objectives
5. Science Background and Rationale
6. Technical Approach
7. Expected Outcome/Benefits
8. Education and Public Outreach
9. Management Plan
10. Cost Plan
11. Personnel
12. Facilities
13. Appendices

# Title

---

- Develop an eye-catching title that is descriptive and has key words first

## TITLE CONTEST

*A Novel Approach to Mapping Atmospheric Ozone*

*A Low-Cost Laser Occultation Sensor for Precisely Mapping Global Atmospheric Ozone*

*Precise Mapping of Global Atmospheric Ozone:  
A Low-Cost Laser Occultation Sensor*

Which one do you think is a good title?

# Title

---

- Develop an eye-catching title that is descriptive and has key words first
  - Titles are often cut off so they fit into a smaller amount of space

## TITLE CONTEST

*A Novel Approach to Mapping Atmospheric Ozone*

*A Low-Cost Laser Occultation Sensor for Precisely  
Mapping Global Atmospheric Ozone*

*Precise Mapping of Global Atmospheric Ozone:  
A Low-Cost Laser Occultation Sensor*

Which one do you think is a good title?

# Abstract

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- Always required
- Will be the first thing read
- ***May be the only thing read*** (particularly by the final selector)
- Should succinctly frame and distill the proposal
  - State the problem
  - Summarize the solution
  - Summarize the benefits
  - Show how the work relates to the call
  - Give the time frame
  - Mention the team and qualifications
- Write it expansively, then cut it down
- ***Remember Step-1 -> Step-2 edits***

# Introduction

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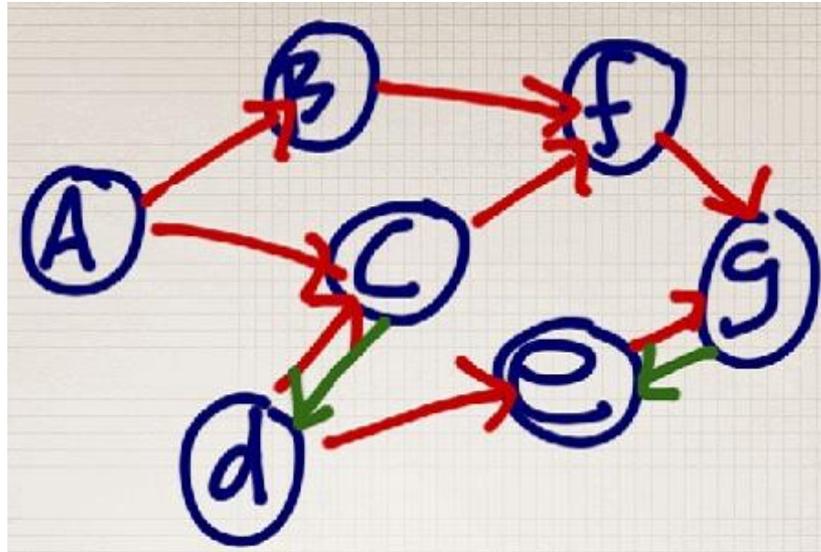
- Shape it as an extended abstract, a guide and roadmap to the rest of the proposal
- Emphasize clarity, readability, absence of jargon
- Demonstrate your grasp of the field
  - Offer a short, well-researched overview of relevant science and technology, as well as current practice...**state of the art**
  - Cite key references
    - With luck, your referee will be among your citations
- Include 1–2 figures showing state of the art and **how you will advance it**
  - When reviewer is arguing on your behalf, he/she can jump to a compelling figure

## Problem Statement and Objective

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Clearly define the problem and continuously reference back to it, ***box this in!***

- Every proposed action should be ***traceable*** to the stated objective!



# Science Background and Rationale

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- Cite sponsor strategic plan or similar document, if possible
- Address their issues directly and concisely
- Show easy familiarity with issues
- Don't write a dissertation or science paper



# Technical Approach

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- Usually the bulk of the proposal
- Continuously point back to Objectives
- Provide clear and logical sequence of activities, with visuals
- Use descriptive and frequent subheads
- Condense key facts into figures and tables
- Highlight critical challenges and risks



# General Guidance for Background and Technical Approach

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- Thoroughly review and cite the relevant literature
- Avoid full pages of text
- Accentuate the positive
  - Avoid creating the rabbit hole for reviewers to fall down
- Be clear and explicit.
  - Highlight your strengths and explain how you intend to mitigate your weaknesses
- Define acronyms and unfamiliar technical terms on first use
  - Have someone not in your field help with finding these
- **RUN SPELL-CHECK**
  - Proof-read to avoid irritating your reviewer

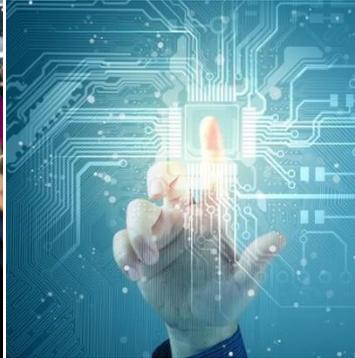


Captions are read before detailed text. Use graphics and figures effectively for impact.

## Expected Outcome/Benefits

---

- Relate directly to sponsor mission and directly back to the call as needed!
- Address multiple levels (local, national, strategic)
- Address several categories (scientific, societal, technological, commercial)



# Personnel and Management Plan

- Justify yourself as PI and defend your selection of Co-Investigators
  - A role for every team member
  - A team member for every role
- Demonstrate excellence; don't just claim it
- Define clear roles and responsibilities, qualifications of key personnel
  - use tables!

Tasks	2018												2019												2020												2021		
	Year 1						Year 2						Year 3																										
	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M			
Modifying Starter Workshops																																							
Creating/Modifying Advanced Workshops																																							
Opening/Editing Virtual Sign Up Page																																							
Creating Feedback Survey																																							
Starter Virtual Workshops																																							
Receive Virtual Survey Feedback- Starter																																							
Implementing Changes from Survey Feedback																																							
Advanced Virtual Workshops																																							
Receive Virtual Survey Feedback- Advanced																																							
Implementing Changes from Survey Feedback																																							
Conference Workshops																																							
Receive Survey Feedback- Conferences																																							
Implementing Changes from Survey Feedback																																							
Posting Updated Presentations																																							

# Time and Costs

- Can you do the job on the schedule?
  - Reviewers will be skeptical!
- Can you do the job for the budget?
  - Program Officers will be skeptical!
- Prove it!
  - Provide SPECIFIC intermediate milestones
    - Offer substantial, incremental improvements, e.g.,
      - 8× better detector in three 2× steps every 6 months
      - Measurement of hundreds of galaxies leading to catalog of thousands of galaxies
      - 30 K improvement in detector operating temperature
      - 4×4 focal plane array in 1 year; 16×16 in 3 years
  - Cite record of on-time, on-budget achievement

Types of Tasks	2018	2019	2020	2021
	Program Year 1	Program Year 2	Program Year 3	Program Year 3
Creating/Major Modifications Workshops	0.10 FTE	0.05 FTE	0.05 FTE	0.05 FTE
Opening/Editing Virtual Sign Up Page	0.05 FTE	0.01 FTE	0.01 FTE	0.01 FTE
Implementing Changes from Survey Feedback	0.05 FTE	0.10 FTE	0.10 FTE	0.10 FTE
Starter Virtual Workshops	0.08 FTE	0.09 FTE	0.09 FTE	0.09 FTE
Advanced Virtual Workshops	0.06 FTE	0.09 FTE	0.09 FTE	0.09 FTE
Conference Workshops	0.05 FTE	0.05 FTE	0.05 FTE	0.05 FTE
Posting Updated Presentations	0.01 FTE	0.01 FTE	0.01 FTE	0.01 FTE
<b>Total FTE per Program Year</b>	<b>0.40 FTE</b>	<b>0.40 FTE</b>	<b>0.40 FTE</b>	<b>0.40 FTE</b>

## More on Budgets

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- Have a clear budget
  - include detailed budgets for co-I and narrative summary and justification
- Transparency
  - don't try to sneak things into the budget
- Justify all travel
  - travel? Page charges in Year 1?
- Be sure to justify why this program and, should multiple funding outlets be involved, be exquisitely clear on which part will be funded by each source.
  - Be sure to justify why multiple funding sources are needed

## Facilities and Appendices

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- Follow Guidebook Instructions
- Keep to the focus of the proposal and don't try to sneak in new scientific information here
- Do not include Appendices not requested by the solicitation!
- Don't expect the majority of panelists to read this section.

# Overall Proposal Development Advice

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- Read the NRA: Are you responsive?
- ***Read the NRA again***
- Demonstrate excellence; don't claim it
- ***Go back and really read the NRA***
- You need a reviewer to champion your proposal
  - Make it easier for them by providing concise material up front
- Examine the selection criteria and directly address them up front
  - A reviewer should be able to lift sentences from your introduction that could go into their review
- Proposals lose because of single sentences or paragraphs
  - What did you say or forget to say that could hurt you?
  - Get folks to review your work before submitting and use their feedback

# ROSES Compliance Checklist

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- NASA ROSES Table 1 handout
- Use these handouts as a checklist for ensuring you have all complaint materials needed to submit your ROSES-2018 proposal.
- Need extra copies? Check the ROSES Summary of Solicitation (SoS) each year
  - <https://nspires.nasaprs.com/external/viewrepositorydocument/cmdocumentid=611943/solicitationId=%7BE2CB9318-72CB-C51A-6962-013E762AE713%7D/viewSolicitationDocument=1/ROSES2018SoSlinksFixed100418.pdf>

# Top 10 Proposal Writing Mistakes

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1. You think you know what the reviewer wants
2. You haven't proof-read the entire document
3. You don't think its necessary to have someone else review the proposal before submitting
4. You think your reputation speaks for itself
5. You think the best references are your own
6. You think you don't need to reread the NRA
7. You haven't gone through your checklist to ensure everything is there
8. You think you don't need to state the obvious
9. You think reviewers will read your whole proposal
10. You think you are finished
- 10b. You think these are the only mistakes that can be made...

# Peer Review

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# The Basics

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## Every Proposal has two Audiences

### 1. *Program Officer, Manager, Point of Contact*

- Ensures that the work will further the Program's objectives and verifying that funds/time/etc. will be used properly
- Relies on you writing a **COMPLIANT** proposal

### 2. Review Panel

- Ensures that the work is of high scientific quality



**Your job is to make it as easy as possible for these two audiences to select your proposal**

## In General...

- The Program Officer/Coordinator chooses panel members from science community
  - Not necessarily from your direct field of science
- Conflicts of interest are avoided
- Internal & External Reviewers may/may not be used
- Proposals are given a score/assessment, based on strengths & weaknesses of set criteria
- During peer review, Program Officer/Coordinator ensures all evaluations are fair & unbiased
- Large panels may be split into sub-panels
  - Plenary sessions may be used to ensure consistency
  - Dog Show Rule: Proposals are not to be compared to each other by review panel



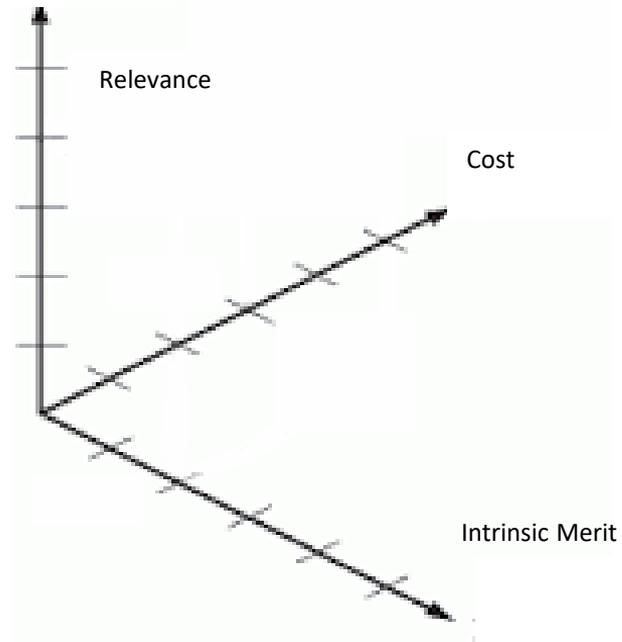
# Peer Review for NASA ROSES

## The Evaluation Criteria

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- Criteria are assessed *independently* of one another, and a low rating in any one is cause for non-selection:

- 1. Intrinsic Merit**
- 2. Relevance**
- 3. Costs**



## Peer Review Intrinsic Merit

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1. The scientific quality of the proposed project, including, but not limited to, the scientific rationale and the expected significance and/or impact of the proposed work.
2. Overall technical quality of the proposed work, including, but not limited to, the quality of the management plan and project timeline for carrying out the work and the effectiveness and resilience of the proposed experimental designs, methods, techniques, and approaches for achieving the proposed goals and/or objectives.
3. The qualifications, capabilities, and related experience of personnel demonstrated by the proposal (e.g., publications, delivered products, and other measures of productivity and/or expertise) that would affect the likelihood of achieving the objectives.
4. Facilities, instruments, equipment and other resources or support systems presented in the proposal that would affect the likelihood of achieving the proposed objectives.

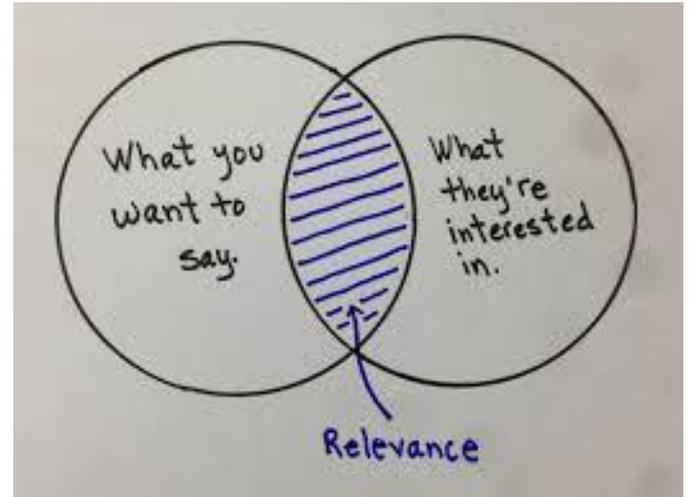
**Additional criteria may be found in specific call  
Look for language “will be judged/reviewed upon”**

# Peer Review Relevance

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## (judged against the text of the NRA)

1. How effective is the proposal's claim of relevance?  
Assuming everything works, would the results be relevant to the program?
2. Criterion is a little complicated for most reviewers.
3. The panel evaluates how well the proposal justifies its relevance to NASA & the program
4. The panel's judgment of the relevance of the proposed work, independent from the stated justification, can also be communicated to the Discipline Scientist
5. Importance varies by program — sometimes it's really binary.



# Peer Review Cost

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## This Does NOT Mean Total \$\$\$

1. Are the resources requested (FTEs, travel \$, supplies, etc.) appropriate for the proposed research program? Are the amounts of resources requested realistic given the panelists experiences as researchers? Is the budget clearly described and justified, including all major sub-contracts or sub-awards?
2. “Cost reasonableness” is not really “bang for buck” (you do NOT see salaries or overhead)
3. Reviewers do not evaluate the “bottom line”



## Other Issues

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- Read the Call carefully to ensure you cover all criteria
- Crying Baby on an Airplane Rule
  - Assume your reviewer is highly distracted when reading your document
- Things that upset reviewers
  - Typos
  - Full pages of dense text
  - Lack of clarity and specificity
  - Lack of organization
  - Lack of relevance to the call
  - Your abstract/summary is old and not on the actual topic of the proposal

## Serving on Panels = Greater Understanding of Peer Review

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- Volunteer for Review Panels for NASA ROSES  
<http://science.nasa.gov/researchers/volunteer-review-panels/>
  - Please respond as soon as possible
  - If you can't travel, let us know that you would be willing to be a virtual panelist
  - Offer to serve as an external if needed
- Participating in a review, whether in person, virtually, as an external reviewer, or executive secretary is confidential

# Selections & Programmatic Balance

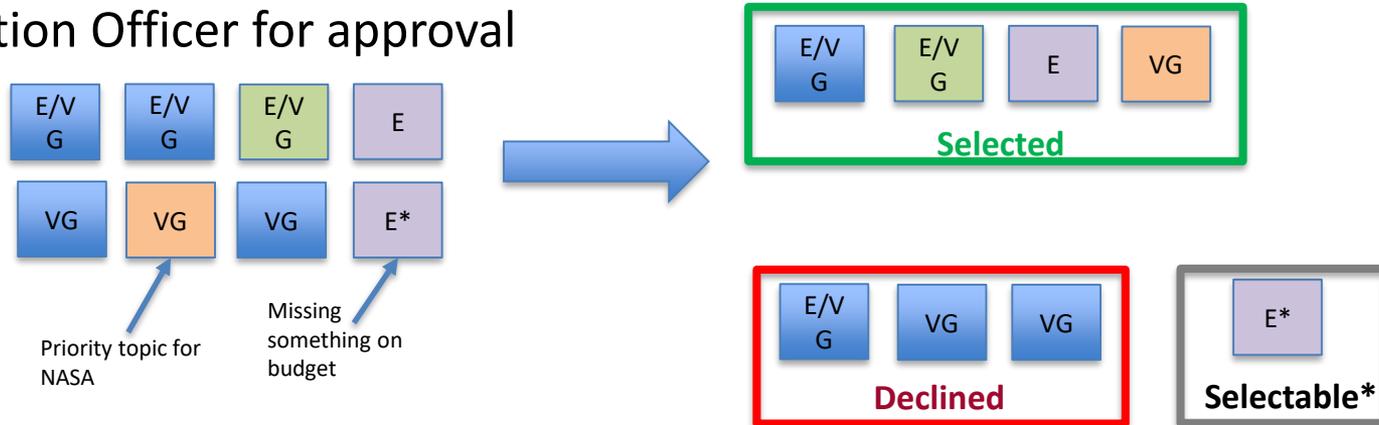
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Christina Richey

# After the Peer Review: What does the Program Officer Do?

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- Program Officer integrates findings of panel with programmatic and budgetary considerations
  - Program balance is an important factor
  - Budgets and time commitments are reviewed
- Program Officer formulates list of recommended selections and submits to Selection Officer for approval





## Suggestions: When You are not Selected



- If you simply must fire off an email to the Program Officer questioning their intelligence and integrity and that of the review panel, write it and email it to yourself
- Remember that R&A programs are very competitive and you often have to submit multiple times
- After you receive your review, arrange a debrief with the Program Officer to answer any questions
- Contest the review if you feel that major mistakes were made
- Always use the comments from the Review Panel to improve your proposal before proposing again
- Agree/Volunteer to serve on Review Panels



## Suggestions: When you are Selected

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- Serve on a review panel
- Stay in touch with the Program Officer regarding funding receipt
- Submit your Progress Report on time
- Plan far ahead if you have a critical deadline for receipt of funds
- Invite the Program Officer to your talk/poster

# Wrapping Up

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## If You Remember Nothing Else, Remember This

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- The opportunities are available: find them, learn them, make them yours
- Follow the Guidebook for Proposers and read the NRA for the program
- Your job is to make it as easy as possible for your two audiences to select your proposal
- Think before writing, critique before submitting
- Peer review levels the playing field – use it to your advantage
- It is never too early to start gaining proposal experience
- Networking really is a critical part of career: get your name out there in positive ways!

# Career Development Programs

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## NASA Earth and Space Sciences Fellowships (NESSF)

- The purpose of NESSF is to ensure continued training of a highly qualified workforce in disciplines needed to achieve NASA's scientific goals
- Proposals are due early February each year via NSPIRES
- While JPL cannot have NESSFs, Caltech can and JPLers can Review for the program!

## NASA Postdoctoral Program (<http://npp.usra.edu>)

- Provides NASA Centers with the responsibility to identify candidate postdoctoral opportunities that meet one or more of the following objectives:
  - a. conduct cutting edge scientific research consistent with NASA's and SMD's strategic objectives
  - b. recruit the finest early career scientists for short-term, focused research opportunities
  - c. infuse new skills into, and revitalize, both new and existing research groups





FEEDBACK