

Purpose of Proposal Assignment

- Develop deeper understanding of your topic
 - Properties of one planet, moon, class of bodies, planetary system...
- Synthesize knowledge across classes/papers
 - Identify what is interesting about your topic
 - Connect to concepts and principles from earlier in class
 - Identify key open question(s)
- Introduction to the art of proposal writing

Class Proposal Requirements

- Develop a research proposal related to planetary astrophysics. It can be for observations, theoretical modeling, an instrument
- Select a program that could support your proposed research (e.g., NOAO, HST, GTC, NASA Origins, NASA Keck, NSF AAG, NSF ATI). Generally follow the proposal requirements for your selected program, but keep to <3 pages of 12pt text.
- Send me PDF of your proposal by November 18. Include a list of the relevant evaluation criteria (particular to the program for your proposal) on a separate page.
- Your proposals will be read by the entire class, and judged by the primary reviewer among your peers.
- Turn in your reviews of your peers' proposals according to applicable evaluation criteria by end of November 21.
- The primary reviewer will lead the discussion for the proposal during a mock panel review.

How to Write a Strong Proposal

- Become an expert in some sub-sub-field
- Think of an important, interesting question
- Develop plan & identify needed resources
- Identify what program can provide them
- Prepare to write a proposal
- Write the proposal
- Get feedback in time to improve the proposal
- Revise the proposal, repeat
- Learn from reviews, repeat

Become an Expert in Sub-Sub-Field

- Become familiar with the field, relevant literature and capabilities.
 - What are big questions in the field?
 - How does your sub-field relate to the bigger picture?
 - What other researchers are working in your sub-field?
 - What are their areas of specialty/interest?
 - What have they done? What has been left undone? Why?
 - What are other researchers are doing now?
- With a strong, comprehensive, integrated knowledge base, you can:
 - Identify interesting and tractable research questions,
 - Develop a clear, consistent vision for your research & proposal
 - Write with a clarity that conveys the clarity of your thoughts
 - Become confident & excited about your research, instill in reviewers
 - Synthesize information to link prior results, concepts, ideas, goals, objectives, and performance

Think of Important, Interesting Question

- What are big/important questions in your field?
- What research is needed to reach those goals?
- What capabilities exist for addressing those goals?
- How can I/our team make a valued contribution?
 - Test hypothesis/model? Measure a parameter? Solve a problem?
- This can seem intimidating at first, but as you become an expert in your field, it gets easier.
- Great proposals often synthesize information across fields.
 - Learn from your advisor
 - Go to talks that aren't just about your sub-field.
 - Interact with others (e.g., visitors, conference participants) to learn what they think are important questions

Identify Way to Obtain Needed Resources

- What are the areas of expertise, strengths, and existing resources of your team?
- What other resources (telescope time, funding, expertise, computing facilities, computer codes) do you need to address your question?
- What mechanisms (i.e., funding agency, particular program, TAC) exist to provide those resources?
- Learn details of those programs & opportunities:
 - What are the goals of each program?
 - What resources are realistically available?
 - What are the deadlines & requirements?
 - What is required to field a competitive proposal?

Prepare to Write a Proposal: A “good idea” is not enough

- Good ideas have to be clearly connected to the program’s purpose
- Knowledge of the program helps you develop a strong proposal and write effectively.
- What is a selectable idea? Basic research? Mission focused?
- Who is the audience (e.g., TAC, program officers, and reviewers)?
- How can you write so your target audience understands and appreciates your proposal?

Prepare to Write a Proposal:

Learn details of those programs & opportunities

- Read and re-read the AO/RFP to fully understand it, both in detail and as a whole.
- If ambiguous, ask advisor/peers and then program officer/TAC member.
- How could you fine-tune the question so that it would be more relevant to the goals of the funding agency, particular program, or TAC?
- How will the proposal be evaluated?
- What has this program supported recently?
- Read recently selected proposals

HST GO Selection Criteria

- Scientific merit and its potential contribution to the advancement of scientific knowledge.
- Importance to astronomy in general.
- Is expertise of the proposers sufficient?
- How will proposers maximize the scientific return?
- How the results will be made available to the astronomical community? Timely publication of the results of any previous HST programs.
- Rationale for selecting the type & number of targets
- Why are the unique capabilities of HST required to achieve the science goals of the program?
- Has the project already been pursued to the limits of ground-based and/or other space-based techniques?
- Number of orbits or targets, and the efficiency of HST time.
- Is the project technically feasible and what is the likelihood of success? Quantitative estimates of the expected results and the needed accuracy of the data must be provided.

NSF Review Criterion 1: Intellectual merit of the proposed activity

- What role does the proposed activity play in advancing knowledge and understanding within its own field or across different fields?
- To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts?
- How well conceived and organized is the proposed activity?
- How well qualified is the individual or team to conduct the proposed research?
- Is there sufficient access to resources?

NSF Review Criterion 2:

Broader impacts of the proposed activity

- Which national goal (or goals) is (or are) addressed in this proposal? Has the PI presented a compelling description of how the project or the PI will advance that goal(s)?
- Is there a well-reasoned plan for the proposed activities, including, if appropriate, department-level or institutional engagement?
- Is the rationale for choosing the approach well-justified? Have any innovations been incorporated?
- How well qualified is the individual, team, or institution to carry out the proposed broader impacts activities?
- Are there adequate resources available to the PI or institution to carry out the proposed activities?

Get Feedback to Improve the Proposal

- Write ~1 page summary of your idea.
- Make outline of your proposal.
- Request early feedback from advisor/colleagues on big picture
- Understand their suggestions.
- Revise idea to incorporate their suggestions.
- Repeat with different colleague.

Write the Proposal

- Copy proposal requirements into your first draft: including **the review criteria**.
- Use section and subsection headings that make sure you explicitly address each requirement and criteria.
- A competitive proposal should clearly address each review criterion, and be structured so that these discussions are easy for reviewers to recognize.
 - Use same order as in the RFP/template/review criteria
 - Echo the language and objectives of the program
 - Use **bold**, *italics*, and underlining to emphasize these

Write the Proposal

- Begin with a clear, crisp statement of research objective:
“The research objective of this proposal is...”
- Write the first paragraph in “layman’s terms” and follow it up immediately with your research objectives listed as succinctly and with minimal technical jargon, acronyms & superfluous information, so reviewers can understand it without reading the whole proposal
- Describe relationship of proposed research to current state of knowledge and long-term goals.
- Why would your results be significant?
- In the process, describe previous research to establish:
 - You are aware of others’ research.
 - That your research will build on and contribute to the field.
 - Your proposed research area is important.

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Probably the most important part of the proposal

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Write the Proposal

- Explain how a set of tractable specific objectives could contribute to long-term goals
- Establish a logical, chronological plan of activities
- Provide enough detail that reviewers can tell:
 - You have a well-thought out plan
 - You are qualified to perform the proposed research.
 - It is practical given the resources you request
- What makes your proposal unique?
 - Why is your research direction so important?
 - Why you and not someone else?
 - Why now? Why hasn't it already been done?
 - Why do you want to do this research?
 - Preliminary results or unusual resources?

Write the Proposal

- Don't make the reviewers search for answers to these questions.
- Use formatting (e.g., italics, underline, bold) sparingly to call attention to *important points*.
- Don't assume that reviewers read/remember your entire proposal. In real life they are probably spending ~5 minutes at best for each proposal.
- Write clearly and concisely

Why Proposals Aren't Selected

- Don't explicitly address all evaluation criteria
- It's already been done.
- Not enough detail/vagueness
- There's not enough research/nothing new
- Perceived as too ambitious
- Lack of evaluation/no application
- Poorly written

How to Make Reviewers Unhappy

These are all bad things

- Incorrect spelling or grammar.
- Use small text or figures with thin lines that can only be understood in color.
- Use equations without defining the variables or explaining the meaning.
- Use inconsistent figure numbers and captions.
- Change formatting halfway through the paper.
- Make it difficult to find where each review criteria is addressed.
- List all of your achievements and describe all of your current research and spend one page describing new work.
- Bounce around from subject to subject. Claim you're going to do x then actually describe y.
- Cut and paste three existing proposals from different people into one proposal, and add a summary page that "glues" the result together.
- Ask for tons of money or observing time to do very little work.
- Assume your reviewer knows your field & jump straight to the details

Revise Your Proposal... Again... Again

- Write a draft proposal well before deadline.
- Request feedback from advisor/colleagues.
- Revise proposal based on their suggestions.
- Repeat
- Proof read for completeness, details, spelling, grammar, style, layout.
- Ask a friend to proof read it.
- Repeat
- Take any reviewer comments seriously.
- Improve your proposal for next time.

Learn From the Reviews

- A proposal can be unsuccessful for many reasons. Identify what affected yours.
- Based on ratings, is it worth resubmitting?
- If so, take reviewer comments seriously.
- Reviews can be incorrect, but you still need to improve your proposal. Think why the reviewer misunderstood your points. Correct them, so that they can't make that mistake again if you resubmit next year.