Mini Proposal Bootcamp

Stanford BIOSCIENCES GRANT WRITING ACADEMY

Stanford MEDICINE | Stanford Biosciences Student Association

Organizers:

Crystal Botham, PhD

Courtney Peña, PhD

Lily Xu

Miles Tyner

Mini Bootcamp Activities:

Workshops - Wednesdays 1-2:30 PM

Orit Rapaport, PhD

- ✓ Getting Started on Your Proposal
- ✓ Writing Crystal Clear Specific Aims
- ✓ Crafting a Compelling Training Plan
- **Addressing the Why, How, & What of the Research Strategy**

Time to Write - Thursdays 4-6 pm

Leah Guthrie, PhD

- A time to work on your proposal or other writing project
- Zoom or in-person (Lorry Lokey Stem Cell Research Building)

* In-person get $5 gift card to Peet's

Scored Review Criteria

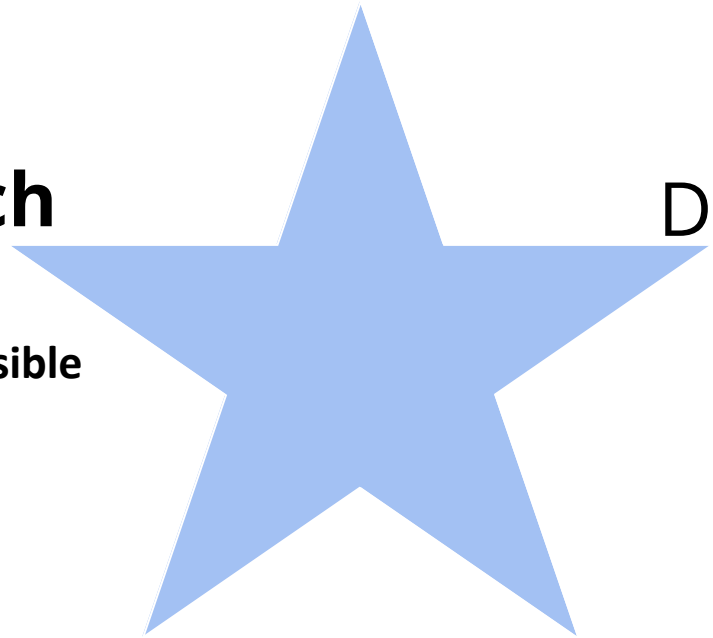
Many Fellowships & Career Development Awards use very similar review criteria but with slightly different names

Candidate

Research Plan

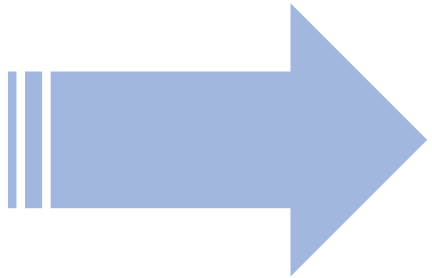
Appropriate; Feasible

Career Development Plan



Environment & Institutional Commitment

Mentors



Independent Research Career

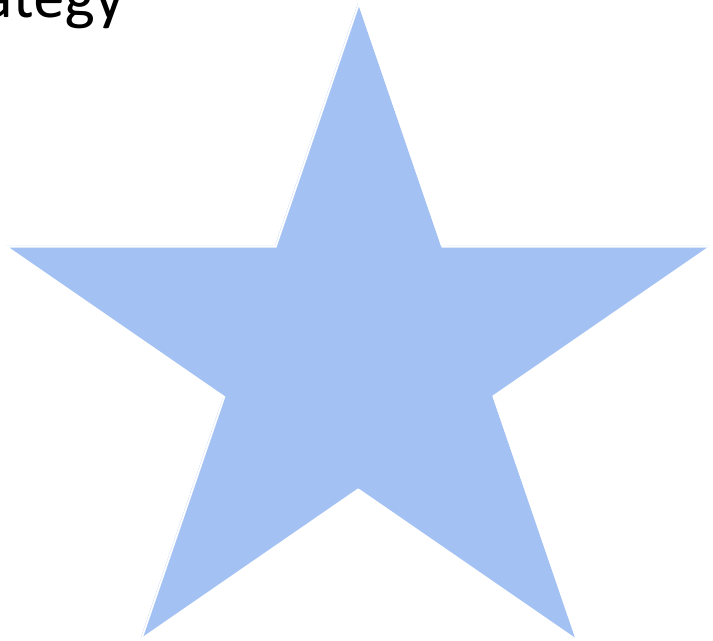
Scored Review Criteria

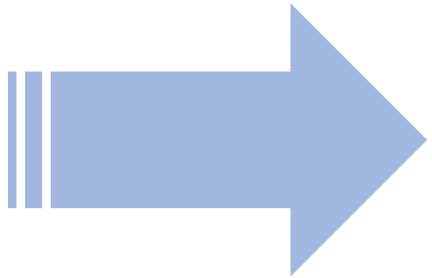
Many Fellowships & Career Development Awards use very similar review criteria but with slightly different names

Important Proposal Docs

- ✓ Specific aims
- ■ Research strategy

Research Plan





Independent Research Career

Your Research strategy:

- ✓ ***Significance*** as a section within other funding opportunities maybe titled Background & Significance
- ✓ ***No designated preliminary section*** in NIH proposals
- ✓ ***Fs have no innovation section*** . It doesn't mean that your proposal is not innovative

NIH Fellowships

Research Strategy

SF424 (R&R) APPLICATION PACKAGES

6 Pages

a) Significance
b) Approach

NIH K Awards

Research Strategy

SF424 (R&R) APPLICATION PACKAGES

8 pages (our recommendation but included within 12 pages with career development documents)

a) Significance
b) Innovation
c) Approach

The Why, How, & What of the Research Strategy

01

Significance

WHY is your research important?

02

Innovation

HOW will you solve a problem in a new way?

03

Approach

WHAT will you do?

Research Strategy: Significance

- NIH instructions
  - Explain the importance of the problem or critical barrier to progress that the proposed project addresses
  - Describe the strengths and weaknesses in the rigor of the prior research (both published and unpublished) that serves as the key support for the proposed project
  - Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields
  - Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved

Previously called "Scientific Premise"

Breakout room #1:
Significance section describes WHY your research is Important

20 min

Significance: How to write

- ✓ Divide this section into parts and give each part a strong title
- ✓ A schematic of your aims adds clarity to this section
- ✓ You may reiterate key sentences from your specific aims

- Answers **WHY** is your research important?
- Length ½-1P
- **Introduce the problem**
  - Brief, but **focused** review of the relevant literature
  - Evaluate the **rigor of prior research**, both published and unpublished, to highlight where gaps in knowledge exist
  - Incorporate data that represents key support for the proposed project
- **State why the proposed research is significant**
  - Use a phrase like, "*The proposed research is significant because…*"
- **Define the return on investing in your proposal**
  - Describe impact to human health relevant to the mission of NIH / Institute
  - The implications for the positive impact your research has, can go *beyond* the proposed outcomes of this proposal and *don't necessarily have to be work that you will do*

Significance:
What will reviewers understand

- ✓ You have the expertise to execute the project
- ✓ Your project is feasible

- You are well versed in the field
- You have a plan to build on what has already been done
- Your work differs from what has already been done
- Your work is needed
- You (mentors/advisory) have **data** to support your argument (hypothesis)

Questions?

The Why, How, & What of the Research Strategy

01

Significance

WHY is your research important?

02

Innovation

HOW will you solve a problem in a new way?

03

Approach

WHAT will you do?

- ✓ **Innovation** is required only for NIH career development awards (K awards)

Research Strategy: Innovation

- NIH instructions
  - Explain how the application **challenges** current research or clinical practice paradigms
  - Describe any **novel** theoretical concepts, approaches or methodologies, instrumentation or interventions to be developed or used, and any advantage over existing methodologies, instrumentation, or interventions

What is an innovation?

- New combination of expertise (unusual multi-disciplinary team), leading to a new perspective
- Newly developed state-of-the-art measurements
- New combination of two previously used methods
- Brining an approach from a different field into a new field
- Refinement of existing model, technology
- Unique samples
- Unique database
- New mechanistic hypothesis

Breakout room #2:
Innovation section describes HOW will you solve a problem in a new way?

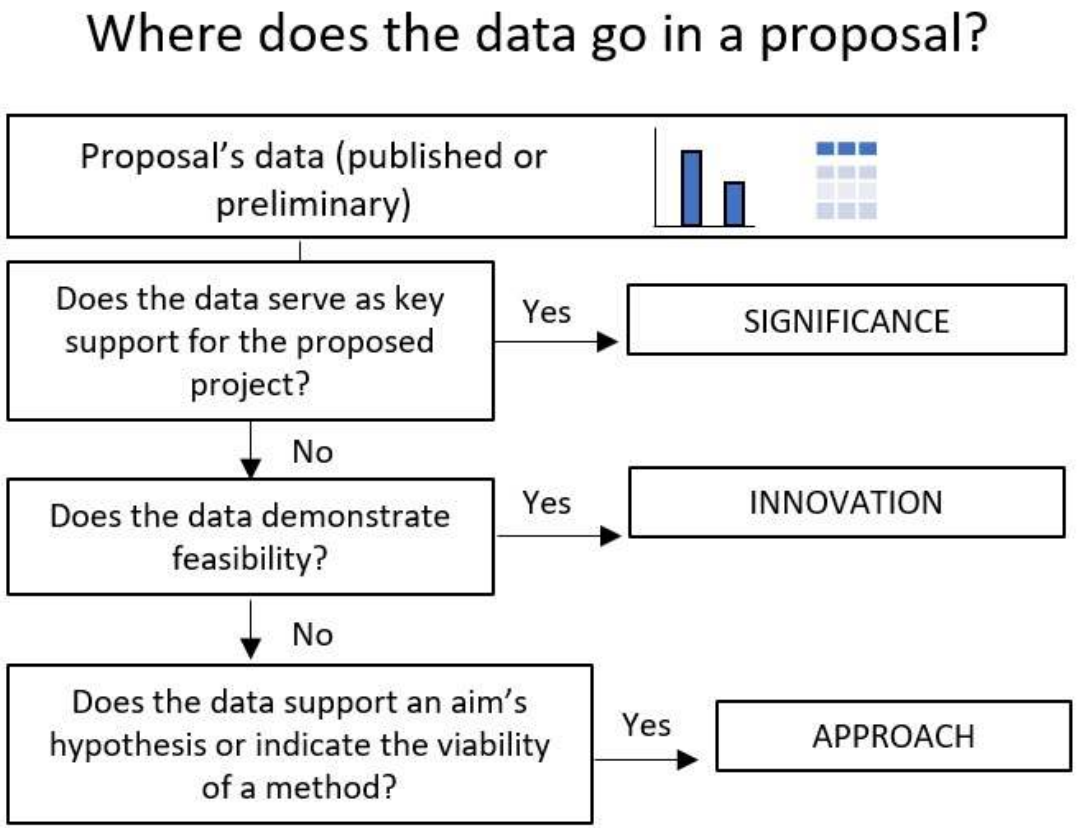
15 min

Innovation: How to write

- ✓ A takeaway title for each innovation
- ✓ Elaborate on the specific aim(s) the innovation is related to
- ✓ Explain how your team will help you execute this innovation

- Answers the question: **HOW** will you solve a problem in a new way?
- Length ½- ¾ P
- **Frame the status quo**
  - Briefly describe the current paradigms, methodologies, tools, etc. that your innovation is challenging, improving, or repurposing
  - Illustrate the barriers that your innovation will overcome
- **Clearly state your innovation**
  - *"The proposed [approach, resources, hypothesis, etc.] is innovative because…"*
- **Describe the impact your innovation will have on the field and beyond**
  - Describe what becomes possible when you overcome the technical or conceptual barriers enabled by your innovation
  - Preface any preliminary data shown in this section as demonstrating feasibility for the described innovation
  - Highlight any new reagents , technology, etc. that will empower future research

Where does the data go in the proposal?



Questions?

The Why, How, & What of the Research Strategy

01

Significance

WHY is your research important?

02

Innovation

HOW will you solve a problem in a new way?

03

Approach

WHAT will you do?

Research Strategy: Approach

- NIH instructions
  - Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project, include how the data will be collected, analyzed, and interpreted as well as any resource sharing plans as appropriate. Describe the experimental design and methods proposed and how they will achieve robust and unbiased results
  - Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims
  - If the project is in the early stages of development, describe any strategy to establish feasibility, and address the management of any high risk aspects of the proposed work
  - Explain how relevant biological variables, such as sex, are factored into research designs and analyses for studies in vertebrate animals and humans
  - Point out any procedures, situations, or materials that may be hazardous to personnel and the precautions to be exercised. A full discussion on the use of select agents should appear in the Select Agent Research attachment

Approach: For most types of research

- A specific hypothesis
- Specific aims and objectives that will be used to examine the hypothesis
- Methods / approaches / techniques to be used in each aim
- Possible problems and how they will be managed
- Alternative approaches that might be tried if the initial approaches do not work

Approach: How to write ?

- Answers the question: **WHAT** will you do?
- Total Length ~5 (Fs) /6.5 (Ks) Pages
  - 1 to 2 pages per aim
  - Introduction – ***provides the conceptual overview of the aim***
  - Justification & Feasibility – ***leads reviewer to conclusion that you can lead the proposed research***
  - Research Design – ***includes meaningful details***
  - Expected Outcomes – ***highlights the return on investing***
  - Potential Problems & Alternative Approaches – ***anticipants and then eliminates concerns***
- Timeline – ***indicates feasibility of proposed plan***
- Future Directions – ***summarizes expected outcomes and next steps***

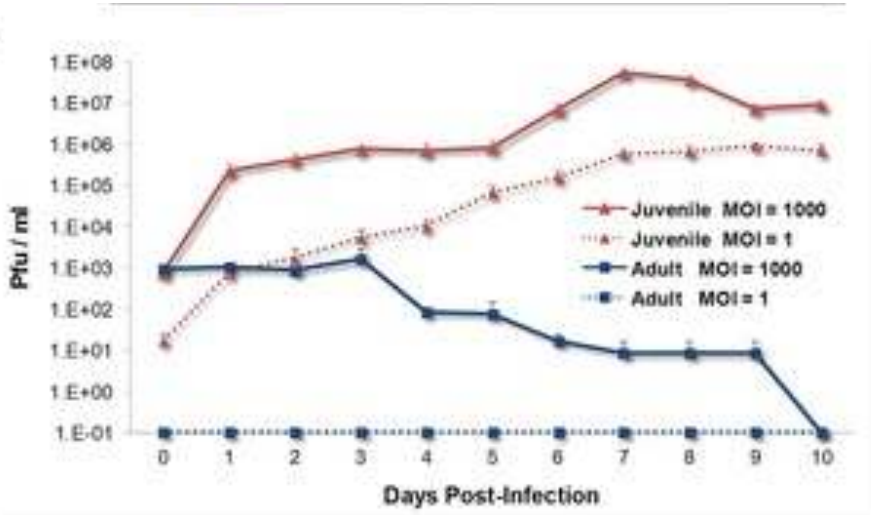
Dissecting the Approach: Introduction/Justification & Feasibility

- ✓ Use the same specific aims titles
- ✓ Use the same hypothesis from the specific aims page

- *Why* the work under this aim needs to be preformed
- *Briefly* discuss what will you do and the overall positive impact of the aim
- Convince the reviewers that you can execute what you are proposing:
  - Critically analyzing the literature
  - Point to relevant gaps
  - Use data

Dissecting the Approach:
How to use data to convince reviewers

- ✓ Must be readable
- ✓ Look OK black and white
- ✓ Stand alone
- ✓ Clear and simple
- ✓ Give a takeaway message



Title Figure 1: These data support my specific aim1
Explanation These data are important in establishing the feasibility of Specific Aim #1 because they validate its underlying concept that …. the *CVB3 virus infects juvenile cardiac cells.*

Sin J, Puccini JM, Huang C, Konstandin MH, et al. (2014) The Impact of Juvenile Coxsackievirus Infection on Cardiac Progenitor Cells and Postnatal Heart Development. PLoS Pathog 10(7): e1004249. doi:10.1371/journal.ppat.1004249
http://www.plospathogens.org/article/info:doi/10.1371/journal.ppat.1004249

Approach: Research Design

Provide meaningful detail

- Approach to be used
- Overview of method(s) to be used
- Essential reagents needed
- Critical equipment required
- Numbers of subjects / animals
- Statistical analysis needed (such as power calculations)
- Controls
- Replicates that will be needed
- Detailed expectations
- How results will be interpreted
- Time required to complete the studies

Approach: Alternative Approaches

✓ Your experienced mentors will assist

- Describe what might go wrong and explain the alternative approaches that you **would** utilize.
- **Include only critically important potential problems and appropriate alternative approaches:** what will happen if your hypothesis is invalidated when objectively tested. Then, describe and justify the alternative hypothesis you would propose.
- **Non-critical potential problems belong in the research design section:** if you are unable to obtain a particular antibody for a pull-down experiment, describe an alternative antibody that you can use in the Methods section instead of the Alternative Approaches section.

These are NOT what you <u>WILL</u> do but would you <u>WOULD</u> do should the problem arise.

Approach:
How to write Alternative Approaches?

1. Nature of the perceived problem
2. Reason(s) why the problem isn't likely to arise
3. What alternative approach(es)/strategy(ies) you would employ should the problem be encountered

For example:

My *hypothesis* for this aim is… Although my preliminary data (see Figure X) solidly supports the hypothesis for this aim and are complemented by recent published work (REFERENCE), there is a remote possibility that it could be invalidated when objectively tested. In that unlikely event, I would turn to ….as the next most likely explanation.

Approach: Timeline

- ✓ Your proposal will have 2 timelines:
  - ✓ A project timeline (Research Strategy)
  - ✓ A training goals timeline (Training Plan)

- How long each task will take and how the tasks fit into your timeframe
- The timeline allows reviewers to quickly grasp how the proposed work will fit together over the course of the funding period

Table 3: timeline of the proposed project

	Task	Year 1	Year 2	Year 3
Specific aim 1		X		
	Data Collection			
	Data Analysis			
Specific aim 2		X	X	
Specific aim 3			X	X
Publications		X	X	
Grant submissions		X		
		X		
	NIH K/R01	X		

Future Directions: Approach

- Length: ½ Page
- A Summary of the main expected outcomes from the entire research project and discusses the future implications of these outcomes
- Reiterate your training goals and describe how this research plan is designed to enable you to gain the skills needed for a future productive research career
- Provide a vision of your next step (K/R01)

Resources for writing the Research Strategy

- **The Grant Application Writer's Workbook**
- **Ten Simple Rules for Better Figures**
- **A Practical Guide to Writing a Ruth L. Kirschstein NRSA Grant 2nd Edition**
- **Enhancing Reproducibility**

Questions?