San Diego Nathan Shock Center
Grant-Writing Workshop

From idea to fellowship/grant application

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Outline of today’s workshop

1. How do I develop an idea for possible funding?
2. How can the Nathan Shock Center Pilot Grant mechanism support the development of my idea/project?
3. How do I write a compelling fellowship or grant application on my project?

Disclaimer:
Based on personal experience/opinion!

Preliminary data, e.g., via NSC cores/pilot grants
1. How do I **develop an idea** for possible funding?

**DISCLAIMER:**
No amount of ‘window dressing’ (grantsmanship) can overcome a bad/non-compelling idea.

i.e., your idea needs to be **NOVEL & IMPORTANT!**

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**How to develop an (irresistible 😊) idea for your grant application**

- Define niche area to develop (need to drive the field significantly forward)
- Collect and critically analyze relevant background information (comprehensively review literature (and NIH Reporter online))
- Generate a preliminary idea that addresses your chosen problem (idea has to be novel and compelling)
- Assess idea’s potential for success and modify it, if necessary (Do I have the ability to pursue the idea? Know and play to your strengths)
- Seek constructive criticism from knowledgeable colleagues (Get feedback from people you trust and respect)
- Refine your idea to maximize its **impact** (Listen and learn from feedback)

Know that this is a PROCESS!
How much preliminary data do I need?

- Need enough data to establish feasibility!
  - As an independent investigator, you need to show you have the tools, reagents and the expertise to carry out the proposed work

- Need enough data to have a strong foundation!
  - While foundation can be based on literature/published data, some preliminary data are almost always part of establishing the basis for your specific project

2. How can the Nathan Shock Center’s Pilot Grant mechanism support the development of my idea/project?
San Diego Nathan Shock Center Pilot Grants

- Annual call for especially junior investigators and for established investigators seeking to join the field of aging research

- 6 x $15K pilot awards to be spent on projects in research cores; awardees will be matched with a senior mentor

- The 3-page proposal includes:
  - Scientific abstract (≤150 words)
  - Significance of the proposed research
  - Experimental approach
  - Budget

- References

- NIH-style biosketch

Watch out for next call later in 2021!

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3. How do I write a compelling fellowship or grant application on my idea/project?
**Mechanisms for funding**

**National Institutes of Health (NIH):**
- Research Training and Fellowships (T & F series)
- Career Development Awards (K series)
- Research Grants (R series)
- Program Project/Center Grants (P series)

For overview: [https://grants.nih.gov/grants/funding/funding_program.htm](https://grants.nih.gov/grants/funding/funding_program.htm)

**R grants:**
- **R21** – “exploratory” research grant, 2 years, modular budget ($275K)**
- **R01** – “basic” project research grant, 5 years, modular ($250K/yr) or non-modular budget**

**non-US citizens can apply if in US lab**

**Mechanisms for funding**

**Some aging-interested private foundations in US:**
- American Federation for Aging Research (AFAR)/Glenn Foundation for Medical Research
- The Larry L. Hillblom Foundation
- American Cancer Society
- American Association for Cancer Research
- American Heart Association
- American Diabetes Association

Study local websites for specific mission, funding tracks, deadlines, eligibility, instructions etc.!
**What is an outstanding research application?**

- New and original set of ideas that will propel the field
- Hypothesis driven with carefully considered outcomes
- Mechanistic studies addressing an important problem

- A focused, incisive and feasible research plan
- A view to the future of this line of research

- A PI who has a strong track record that ensures success
- A strong research environment that can facilitate proposed work

What gets it **FUNDED**?

One key point, really:

It *convinces reviewers* of all of these points!

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**Preparing your research plan**

- Make **list of bullet points** to outline specific research questions related to research idea

- Work these into **tentative Aims, make diagrams of Aims** (i.e., logical representation of idea - if space permits, use in grant; also use to present/discuss grant outline with others)

- Generate/acquire **essential preliminary data** to support technical feasibility and conceptual foundation

- Acquire key reagents (e.g., mouse strains) and arrange **collaborations** where documented expertise is necessary (be realistic but at the same time don’t do too many)

- **Start writing proposal** (at least 2-3+ months to timeline!)
Three important goals to accomplish in research plan of grant

Proposal needs to convince ALL REVIEWERS that:

• Your research addresses an important scientific question (i.e., it is competitive for funding)

• You are the right person to carry out this research (i.e., you have the (documented) skill set to do the proposed research)

• You are using the right system to address your question (i.e., your chosen model organism provides unique advantages)

Keep in mind when writing!

Specific Aims (or abstract)

Many reviewers may only read this, so THE MOST important:

• The Specific Aims page is the focal point for the reviewers and study section.

• Include a general statement of the problem being addressed and why it is important.

• Include a short description of problem and background summary (one paragraph).

• State hypotheses and how proposed experiments will fill gaps in our knowledge.

• Include an outline of the individual aims and methods to be used, expected outcomes and the long-range significance.

• Aims should clearly and succinctly outline the proposed research.
**Research Strategy (R mechanism: 6-12 pages)**

**Required components** (which are also review/score-driving criteria for R grants):

- **Significance**: Premise* of proposal (e.g., preliminary data*), potential of the work to advance the field
- **Innovation**: Originality of approach (conceptual and technical).
- **Approach**: Feasibility of ideas and methods, rigor** needs to be clearly stated

*/**, now explicit score drivers in NIH grants:

- **Premise/Rigor of Prior Research**: Foundation or basis for proposed research; can be published work, or own preliminary data – be sure to reference correctly, if it is not your data!
- **Rigor and Reproducibility**: Explain application of scientific methods used in performing and interpreting experiments, including sample size, number of repeats, statistical methods, etc. – if too little space, at least provide clear referencing here!
- **Biological Variables**: Sex as a biological variable should be factored into design, analyses and reporting

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**Research Strategy (R mechanism: 6-12 pages)**

**Significance:**

- Typically 1-2 pages, can include figures
- State Premise/Rigor of Prior Research of the grant (explicit score driver)
- Include succinct and focused Background for the non-expert
- Preliminary data: state enabling and exciting findings up front, but not to much to make proposed Aims “confirmatory”
- Bring together ideas and results (yours and others)
- Identify gaps and unanswered questions in the field that your proposal will resolve

**Innovation:**

- State technical and conceptual innovation, e.g., in bullet points
Research Strategy (R mechanism: 6-12 pages)

Approach:

Suggested construction of Aims:

- **Overview and rationale** - minimal background to define problem. State hypothesis and how it will be tested.

- **Experimental design** - logical, clear methodology with controls; insert feasibility data (note: preliminary data ≠ statistically unsound data). Explicitly comment on rigor.

- **Possible outcomes** - expected and unexpected (null hypothesis); should not be confirmatory; do not assume that the reviewers will draw the desired conclusion - spell it out.

- **Pitfalls and alternative approaches** - only discuss shortcomings that can practically be addressed; opportunity to emphasis “focus.”

- **Brief summary** - Note milestones/deliverables.

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Research Strategy – The End

Suggested additional components to include, e.g., at the end of proposal:

- **Time table**
  Shows that you have considered how this research will realistically be carried out.

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  TIME TABLE
  Aim 1: Marker construction, TEM, and selective autophagy analysis will be done in Yr 1-4.
  Aim 2: Tissue-specificity and overexpression studies will be done in Yr 1-4.
  Aim 3: Proteomics optimization in Yr 1, candidate studies will be done in Yr 2-3, screens & follow-up in Yr 2-5.

- **Future studies**
  Shows that you have a long-term vision, and helps avoid overambitious plan

  -> Probably the MOST common mistake committed by junior grant writers!
**Investigator - Biosketch (max. 5 pages)**

Utilize green sections to demonstrate your passion, commitment, accomplishments, and contributions to the field:

- **Personal statement** (do not make too long, tailor to application – add up to 4 references)
- **Positions and Honors** (and other experiences)
- **Contribution to Science** (max. 5 sections with up to 4 references; PubMed URL with all references, can note total)
- **Research Support**

**Letters of Support**

- All parties important for success of application should contribute letters, including collaborators, cores (ask directors to write letters), consultants, key reagent providers etc.
- **Always offer to write draft letters**! (note that this can be quite a bit of work as letters needs to read differently)
- **Potential caveat**: conflicts of interest for reviewers at same institute!
Some practical tips about proposals

Contents

• Clear read - logical flow with crisp, short sentences; free of jargon and avoid use of ‘loaded’ words (e.g., ‘this fascinating phenomenon’)
• Use graphics to illustrate concepts and simplify complex experimental schemes
• Explicitly comment on score-driving concepts, i.e., impact, novelty, etc.
• Use compelling arguments aimed to convince non-experts in the field
• Reviewers are not omniscient, but will not admit ignorance…

Form

• Use white space for readability
• Set Font settings to ‘exactly 12’ instead of ‘single’* – gives some extra space that is better used as ‘white’ (easier on the eyes)
• Use (but don’t overuse!) formatting, i.e., underline, italics, bold – use wisely
• Do NOT make figures too small, and the legends smaller than 8-9 points (Why? Reviewer is likely to be >40 yrs old☺)

*Credit to Tom Randy via Anne Brunet, Stanford

Form matters almost as much as contents!

Pipeline: From application to reviews

• Years of research by YOU…..
• Months of writing by YOU…
• Hours of reading/reviewing by reviewers..
• Minutes of discussion on panel!

Make proposal easy to read & understand!!

*Link to video of mock NIH study section:
https://www.youtube.com/watch?v=IkJhRkRtjM
Some information relevant to NIH grant applications

Timeline: R grants

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<th>Cycle III</th>
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<tr>
<td>R21 (resubmit)</td>
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Core components: R grants

Scientific files:
• Specific Aims
• Research Strategy
• References
• Project Narrative
• Project Summary
• Introduction

Non-Scientific files:
• Coverletter (for CSR only)
• Biosketch
• Equipment
• Facilities
• Budget Justification
• Research Sharing Plan
• Plan for Resource Authentication
• Letters of Support

More Info and Acknowledgements

“The Grant Application Writer’s Workbook”
Russell and Morrison, NIH

Disclaimer: Some of the specific suggestions made in these slides were proposed in this reference.

• Use peers/mentors
• Attend courses/seminars

Special thanks to Drs. Robert Rickert, Joey Davis, & Nisha Cavanaugh, SBP for various slides etc.