Grant writing a merger of art and science

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OME Grand Rounds
My Background

- American Cancer Society Fellowship
- NIH Postdoctoral Fellowship (declined)
- American Cancer Society Scholar
- March of Dimes (Basil O’Connor and Basic science grant)
- American Heart Association Scientist Development Award
- NIH R01
- NIH U01 Coinvestigator
- Several NIH Pilot awards
- Sponsor (1 Postdoc, 6 Predoc (AHA, NIH))
- NIH (Standing study section, Special Emphasis Panel, ACS, AHA, HCF, additional international review panels)
Overview

• Outline the organization of the National Institutes of Health
• Program Announcements and RFAs
• Application and Review Process
• Hypothesis development
NIH Budget

FY 2017 NIH Budget
$33.1 Billion – Estimated Percent Total by Mechanism

- Research Centers 7.8%
- Intramural Research 10.9%
- Research & Development Contracts 9.6%
- Research Training 2.6%
- Research Management and Support 5.2%
- Facilities Construction 0.5%
- Other Research, Superfund, Office of the Director 8.5%
- Research Project Grants 54.9%
Structure of the NIH

- Intramural Research
  - Research done onsite by NIH scientists
  - 9% of the NIH budget

- Extramural Research – 82% of budget
  - Research grants
  - Training
  - R& D contracts
- Research Management & Support
Fogarty and its partners throughout the National Institutes of Health (NIH) are working to build sustainable research capacity in low- and middle-income countries (LMICs).
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Research Portfolio Online Reporting Tool (RePORT)

http://report.nih.gov

- A searchable database of federally supported biomedical research
- Access reports, data, analyses, expenditures, results of NIH supported research activities
- Identify, analyze IC research portfolios, funding patterns, funded investigators:
  - Identify areas with many or few funded projects
  - Identify NIH-funded investigators and their research
  - Identify potential mentors/collaborators
NIH Guide for Grants and Contracts

• Official publication listing NIH funding opportunities and policy notices
• Request for Applications (RFA)
• Program Announcements (PA, PAR, PAS)
• Request for Proposals (RFP)
• Notices (NOT)
• Published daily, distributed weekly
Where does this fit in my career?

- https://grants.nih.gov/grants/funding/funding_program.htm
- Refers to the kind of research activity that can be funded
  - F series  Fellowships
  - K series  Career awards (K08, K12)
  - P series  Program projects and centers
  - R series  Research projects (R01, R25)
  - T series  Training programs
  - U series  Cooperative agreement

Not all institutes support all funding mechanisms
Why do you want to write a fellowship?

1. Makes the relationship with the PI explicit
2. Benefits associated with grant
3. Looks good on your resume
4. Great learning experience
5. Stipend bonus

http://grants.nih.gov/grants/partners/NexusImages/September06/submit.jpg
Grant Budgets

• DIRECT COSTS: (GO TO THE PROJECT)
  • Personnel costs (salary + ~48% fringe benefits rate) – specifying % effort for each person
  • Equipment
  • Supplies
  • Subject payments/ incentives
  • Travel

Each person and item needs to be justified in budget justification section of grant
Grant Budgets

• INDIRECT COSTS: (GO TO INSTITUTION)

  • Money goes to the institution to provide facilities and administrative support to researchers
  
  • Rate calculated by periodic negotiations between each institution and the Federal Government – at UH currently 54%.
  
  • For every dollar of direct costs (excluding large equipment purchases) UH gets an additional $.56.
  
  • Usually indirect costs are given OVER AND ABOVE budget limits. Usually ceilings apply only to direct costs.
  
  • How that money gets divided up within the institution varies a great deal from place to place. For many medical schools, the dean/central admin gets half, the department gets half (in large depts., shared with the division and investigator in some way for resources).
Grant Writing for Success

Writing the Application:
- Start Planning **EARLY**
- Develop your good idea
- Use the NIH webpage (www.nih.gov)
- Talk to your NIH Program Official(s)
- Provide a good presentation
- Align with review criteria
- Identify collaborators
- Seek advice and feedback from colleagues
- Funding & peer review
Pre-Submission Planning Timeline

**Planning Phase**
- **Months before receipt date:**
  - 8: Assess yourself, your field, and your resources
  - 7: Brainstorm; research your idea; call NIAID program staff; call NIH
  - 6: Set up your own review committee; determine human and animal subject requirements

**Writing Phase**
- **6 months before receipt date:**
  - First outline your application’s structure; then write your application
  - Get feedback; edit and proofread

**Submission Phase**
- **1 month before receipt date:**
  - Meet institutional deadlines

**Receipt date**
Where to start?

Read the instructions.

Again.

Ask for advice in time to learn and prepare:

a research question,

specific aims,

hypotheses,

and long-term research goals.
Good Idea

• Does it address an important problem?
• Will scientific knowledge be advanced?
• Does it build upon or expand current knowledge?
• Is it feasible …
  • to implement?
  • to investigate?
  • in my hands/lab?

http://www.niaid.nih.gov/researchfunding/grants/strategy/apply#instrstrat
A strong research idea should pass the “so what” test. What is the benefit of answering your question? Who will it help and how? If you cannot make a definitive statement about the purpose of your research, it is unlikely to be funded.
Formula

There are many successful formats for a proposal
Reiterate key points/significance again and again
Good proposals are easy to read
  Adequate spacing
  Helpful visuals
  Readily identifiable sections
  Clearly labeled, believable, and visible preliminary data
Use consistent formatting
  Bold
  Italics
  Underline
  Indentation
Predict what a reviewer wants to see
Do not get bogged down into details
Need to Knows

Your audience
- Study section rosters available
- Expertise range
- Model organism range

Past awardees
- Knowing what was funded in the past is helpful

Goals of the granting agency
- Institutes publish their mission statements

The approach is what makes or breaks a proposal
- You can have the best ideas but without a clear plan in mind you will not get funded
Basic Outline

Significance
Innovation
Relevance to funding agency
Background/ (preliminary data)
Research design
  Rationale
  (Preliminary data)
  Approach (Preliminary data)
Expected results
Potential pitfalls and alternatives
Timeline
Overall impact
Grant Review Process

• Sent to Center for Scientific Review, directed to an I/C
• Assigned to a Study Section (can request specific assignment)
• Reviewed ~ 4 months later when Study Section meets
• After study section meets (usually a few days) get score, summary statement follows within 30 days.
SIGNIFICANCE

• Does this study address an important problem?
• If the aims are achieved, how will scientific knowledge be advanced?
• What will be the effect on concepts or methods that drive this field?
Core Review Criterion #2

INVESTIGATOR

• Are the investigators appropriately trained and well suited to carry out this work?
• Is the work proposed appropriate to the experience level of the principal investigator and other researchers?
• Does the investigative team bring complementary and integrated expertise to the project (if applicable)?
Core Review Criterion #3

**INNOVATION**

- Does the project employ novel concepts, approaches or methods?
- Are the aims original and innovative?
- Does the project challenge existing paradigms or develop new methodologies or technologies?
Core Review Criterion #4

APPROACH

• Are the conceptual framework, design, methods, and analyses adequately developed, well-integrated, and appropriate to the aims of the project?

• Does the applicant acknowledge potential problem areas and consider alternatives?
ENVIRONMENT

• Does the scientific environment in which the work will be done contribute to the probability of success?

• Do the proposed experiments take advantage of unique features of the scientific environment or employ useful collaborative arrangements?

• Is there evidence of institutional support?
Rigor and Transparency in Research

To support the **highest quality science, public accountability, and social responsibility in the conduct of science**, NIH’s Rigor and Transparency efforts are intended to clarify expectations and highlight attention to four areas that may need more explicit attention by applicants and reviewers:

- **Scientific premise**
- **Scientific rigor**
- **Consideration of relevant biological variables, such as sex**
- **Authentication of key biological and/or chemical resources**
Specific aims

steps you are going to take to test your hypotheses
what you want to accomplish in the course of the grant period

Make sure:
Your objectives are measurable and highly focused
Each hypothesis is matched with a specific aim
The aims are feasible in technique, time and money

http://www.theresearchassistant.com/tutorial/2-1.asp
Strong hypotheses:

• Give insight into a research question

• Are testable and measurable by the proposed experiments

• Spring logically from the experience of the lab and you

Make sure you:
• Provide a rationale—where did hypotheses they come from, and why are they strong?
• Provide alternative possibilities that could be tested why did you choose the ones you did over others

Good hypotheses will lead into your Specific Aims.
Developing a hypothesis

• Step one is to think of a general hypothesis, including everything that you have observed and reviewed during the information gathering stage of any research design. This stage is often called developing the research problem.

• Read existing research and become an expert.

• Find a gap in the knowledge

• Ask a question that has not been addressed before. The hypothesis should not be already known or obvious.
Developing a hypothesis

Water levels affect the amount of lice suffered by rainbow trout.
Developing a hypothesis

• Step two refine hypothesis to guide design of research.
• Follow examples from other systems.
• Examine patterns.
• Make your hypothesis go in one direction based on the background information that you have gathered.
• Specify the population to be examined.
Developing a hypothesis

Rainbow trout suffer more lice when water levels are low.
Developing a hypothesis

- Step three refine the hypothesis to design an experiments that can be tested.
- Determine what variables there are.
- Your hypothesis should only reflect one of the outcomes/relationships between your variables.
- Have your experiments look for evidence that would prove the hypothesis wrong.
Developing a hypothesis

Rainbow trout suffer more lice in low water because there is a higher concentration of lice per volume of water.
Grant writing resources

NIAID-Research funding

Quick guide for grant apps

NINDS-Grant writing
http://www.ninds.nih.gov/funding/write_grant_doc.htm#developing

https://www.nigms.nih.gov/training/indivpredoc/Pages/Predoctoral-F31-Sample-Applications.aspx

FASEB Grantsmanship Training Program
https://ns2.faseb.org/careerutilities/grantprg.htm

Grant Application Writer’s Handbook, Reif-Lehrer

NIH Grants database
https://projectreporter.nih.gov
Questions?

“Yes ... I believe there’s a question in the back.”
Grant Application Overview

• 3 regular grant submission cycles every year
  • February 1 (+/- 2 weeks)
  • June 1 (+/- 2 weeks)
  • October 1 (+/- 2 weeks)
  • If a resubmission, due 1 month later (Mar, July, Nov).

• Also special one-shot grant opportunities come up (Requests for Applications or RFAs) with very little notice.
As you write, put the big picture squarely in your sights. When reviewers read your application, they'll look for the answers to three basic questions:

• Can your research move your field forward?

• Is the field important—will progress make a difference to human health?

• Can you and your team carry out the work?