# Physics 4601

# writing proposals

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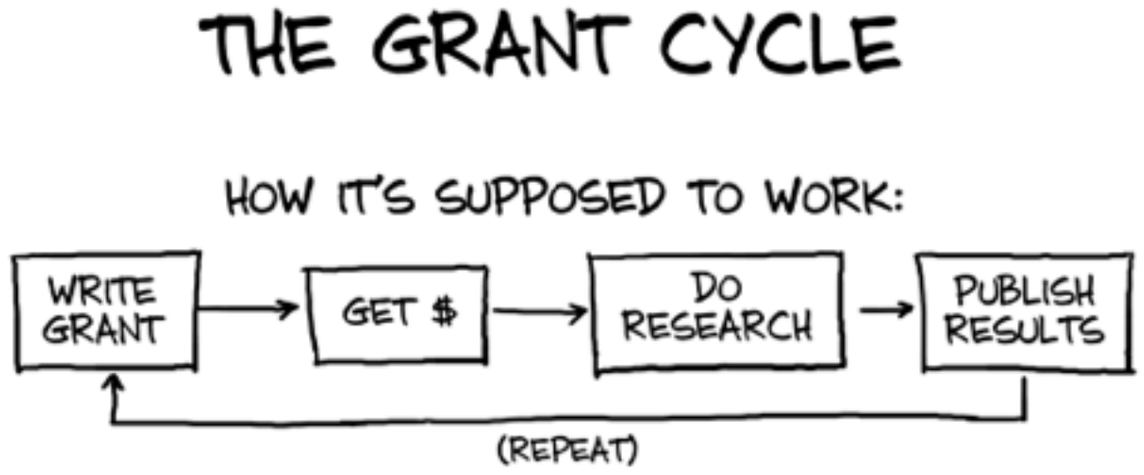
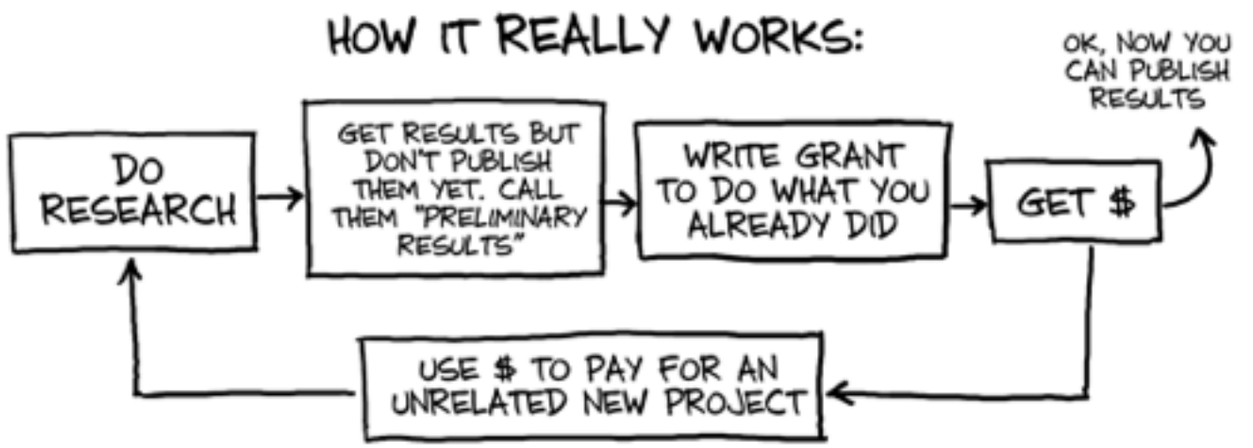
http://simbac.gatech.edu/phys4601/




School of Physics | Georgia Tech | Spring 2018




some material taken from UIUC Grad College
http://illinois.edu/cms/4931/nsf_grf_wrkshp_2015___kv_bh_slides.pptx

# What is a proposal?

## it's an offer to carry out a specific project or projects in exchange for resources to do so

It should

- address a well defined "knowledge gap" **AND** why they should be interested in it
- meet the criteria and requirements of the announcement
- have reasonable and clearly stated goals
  - are you capable of carrying out the work?
  - are the goals achievable in the time frame of the proposal?
  - will achieving the goals address the knowledge gap?
- be specific without being too jargon-y (know your audience!)

- **BE EXCITING!**

# What is a proposal?

**It typically contains**

- a brief synopsis
- background/lit. review - needed to understand the context
  - *this should make it clear that there are questions that remain to be addressed!*
- a research plan
- something addressing significance of the work (why should they fund yours over someone elses?)

# The National Science Foundation

Federal agency created in 1950 to “to promote the progress of science; to advance the national health, prosperity, and welfare; to secure national defense”

Supports research and education in Science, Technology, Engineering and Math (STEM) disciplines - all fields but clinical biomedical areas (covered by NIH)

NSF annually awards about 10,000 research grants, a proposed 2,000 new graduate fellowships (student as awardee), graduate trainees, and +/- 30,000 research assistantships (via grants to Principal Investigators)

Has a budget of ~$7 billion (NIH is $31b, NASA is $18b)

# Why a proposal needs to be excellent

## NSF Success Rates – FYs 2013 & 2012

| Organization/ Directorate | FY | Number of Proposals | Number of Awards | Funding Rate | Average Decision Time (months) | Mean Award Duration (years) | Median Annual Size |
|---|---|---|---|---|---|---|---|
| NSF – Overall | 2013 | 49,013 | 10,844 | 22% | 5.77 | 2.62 | $115,266 |
| | 2012 | 48,622 | 11,533 | 24% | 5.64 | 2.73 | $104,269 |
| Biological Sciences | 2013 | 5,937 | 1,253 | 21% | 5.11 | 2.87 | $138,400 |
| | 2012 | 5,271 | 1,295 | 25% | 5.27 | 2.88 | $120,004 |
| Computer & Information Science | 2013 | 7,821 | 1,616 | 21% | 5.61 | 2.73 | $150,076 |
| | 2012 | 7,692 | 1,738 | 23% | 5.44 | 2.80 | $137,866 |
| Education & Human Resources | 2013 | 4,502 | 794 | 18% | 6.06 | 2.99 | $164,073 |
| | 2012 | 4,281 | 889 | 21% | 6.05 | 3.26 | $126,887 |
| Engineering | 2013 | 10,745 | 2,220 | 21% | 4.92 | 2.32 | $118,140 |
| | 2012 | 11,353 | 2,080 | 18% | 5.03 | 2.51 | $114,593 |
| Geosciences | 2013 | 6,090 | 1,568 | 26% | 7.88 | 2.69 | $129,177 |
| | 2012 | 5,249 | 1,643 | 31% | 7.42 | 2.78 | $111,981 |
| Mathematical & Physical Sciences | 2013 | 8,903 | 2,201 | 25% | 6.10 | 2.92 | $101,643 |
| | 2012 | 9,006 | 2,523 | 28% | 5.81 | 2.92 | $104,965 |
| Social, Behavioral & Economic Sciences | 2013 | 4,433 | 920 | 21% | 5.12 | 2.18 | $46,720 |
| | 2012 | 4,776 | 1,019 | 21% | 5.05 | 2.33 | $43,178 |

Source: NSF website - http://dellweb.bfa.nsf.gov/awdfr3/default.asp

# NSF Graduate Research Fellowship

to help ensure the vitality and diversity of the scientific and engineering workforce of the United States.

recognizes and supports outstanding graduate students pursuing research-based master's and doctoral degrees in STEM fields and in STEM education.

three years of support for graduate education of individuals who have demonstrated potential for significant research achievements in STEM and STEM education

NSF especially encourages women, members of underrepresented minority groups, persons with disabilities, and veterans to apply.

NSF also encourages **undergraduate seniors** to apply.

# NSF GRF benefits

**READ PROGRAM SOLICITATION CAREFULLY!**

- Three years of support over a five year period
- Annual stipend of $34,000 - cost of living to student
- Tuition support of $12,000 - cost of education allowance paid to institution – remainder covered by university
- Cyber infrastructure access via XSEDE
- International opportunities through GROW initiative

# GRF eligibility criteria

- **Academic level**
  - Level 1: Seniors, baccalaureates with no graduate study
  - Level 2: First-year graduate students
  - Level 3: Second-year grad students (12 months of graduate study or less by Aug 1 prior to submission)
    - **NOTE: only Level 2 OR 3, not both!**
  - Level 4: >12 months graduate study – extenuating circumstances

- **Citizenship**
  - U.S. Citizen, National or Permanent Resident

- **Discipline**
  - Research-based Masters or PhD in NSF-Supported Field of study (note changes in various fields, esp. BIO)

# NSF-supported disciplines

- Engineering
- Computer and Information Science and Engineering
- Materials Research
- Mathematical Sciences
- Chemistry
- Physics and Astronomy
- Social Sciences (non-clinical)
- Psychology (non-clinical)
- STEM Education and Learning
- Life Sciences
- Geosciences

# Some areas are NOT supported

- Clinical work
- Counseling
- Business
- Management
- Social work
- Practice-oriented professional degree programs
- Joint science-professional degree programs (MD/PhD and JD/PhD)
- Medical, dental, law, or public health programs
- Education (except research-focused STEM education)

# What is a proposal?

## A more specific outline for the NSF GFP

Introduction

Research Objectives

Hypotheses  (**no "fishing" expeditions!**)

Preliminary Results (**IF** you have any from previous research)

Experimental Approach

Intellectual Merit

Broader Impacts

References

**http://www.malloryladd.com/nsf-grfp-advice.html**

# Graduate Research Plan Statement

- Introduce general theory/area of study and importance - a few references will demonstrate understanding of field
- Panelists are experts in general field; *may not* be experts in your specific research specialty - avoid jargon
- Describe your motivation to go into that area and discuss plans to prepare for that field of study - mention school(s), degree programs, potential advisor, etc.
- Spell out specific details of your research and study plan but avoid jargon, specific experimental details, etc.
- Comment on the broader impacts of your activities
- Let the reader know of your career plans, even if tentative
- Demonstrate flexibility (“plan B”)

# Review criteria

- Potential to advance knowledge and understanding within field or across different fields (Intellectual Merit) and benefit society or advance desired societal outcomes (Broader Impacts)

- Creative, original, or potentially transformative concepts

- Plan is well-reasoned, well-organized, and based on a sound rationale

- Plan incorporates a mechanism to assess success

- Applicant is qualified to conduct the proposed activities

- Adequate resources available for the proposed activities

# Graduate Research Plan Statement

"Present an original research topic that you would like to pursue in graduate school. Describe the research idea, your general approach, as well as any unique resources that may be needed for accomplishing the research goal (i.e., access to national facilities or collections, collaborations, overseas work, etc.) You may choose to include important literature citations. Address the potential of the research to advance knowledge and understanding within science as well as the potential for broader impacts on society."

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1. Research Idea
2. Approach
3. Intellectual Merit
4. Broader Impacts

# For this course

You will write a 2-page research proposal suitable for the NSF GRFP

The proposal will be due on the last day of class, but we will have multiple intermediate deadlines through the semester (more to come soon)

The proposal will be written in Latex

Latex (Lah-tek or Lay-tek) is a typesetting language used by many scientists, especially physicists

you type in “code”, which is then compiled to produce the document

one of the main benefits is mathematical equations and symbols

```
\displaystyle\int_{-\infty}^{+\infty} dx~e^{-\alpha x^2} = \sqrt{\pi \over \alpha}
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$$\int_{-\infty}^{+\infty} dx\ e^{-\alpha x^2} = \sqrt{\frac{\pi}{\alpha}}$$

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**and references!**

```
@article{Li2014,
   author={J. Li and K.F.
Jaimes and S.G. Aller},
   title={Refined structures
of mouse {P}-glycoprotein},
   journal = PS,
   volume = {23},
   number = {1},
   pages = {34--46},
   year = {2014}
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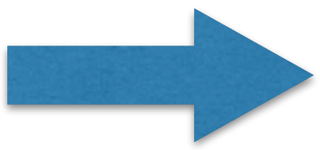

[14] J. Li, K. Jaimes, and S. Aller. Refined structures of mouse P-glycoprotein. *Prot. Sci.*, 23:34–46, 2014.