Securing Grants as a First-Year (Computer Science) Faculty Member

Brighten Godfrey
pbg@illinois.edu

Original version Apr 2013
Lightly revised Feb 2014

Context

My view

- Currently 5th year faculty in Computer Science
- Primary focus in networking and systems
- This presentation is tailored to this setting

The right advice can vary by field and even by area

- Amount of funding needed
- Sources of funding
- Style of grant-writing

How much money do you need?

Per Ph.D. student

- ~ $25-30,000 per year
- ~ $50-60,000 per year with overhead

So you have to raise $300,000 per year

- for a group of 5 students
- + travel, equipment, summer salary ($30k + overhead), ...
- – internships, teaching, fellowships
- – no overhead if paid from gift money (from companies)

Major grant sources

National Science Foundation

- Primary source of most CS funding

DoD

Companies

Special awards

Major grant sources

National Science Foundation

DoD

Companies

- Google Faculty Research Awards
- IBM Faculty Awards
- Cisco
- Verisign
- Intel
- ...

Special awards

Major grant sources

National Science Foundation

DoD

Companies

Special awards

- Microsoft Faculty Fellowship
- Intel Early Career Faculty Honor Program
- Sloan Research Fellowship
- Packard Fellowship
- ...

Major grant sources

My current breakdown:

National Science Foundation	71%
DoD	19%
Companies	7%
Special awards	3%

Common NSF grants

Small: $500k or less over 3 years

- Typically one or two faculty
- Due late fall each year (in CNS)

Medium: $1.2M or less over 4 years

- ≥ 2 two faculty
- Due early fall each year (in CNS)

Large: $3M or less over 5 years

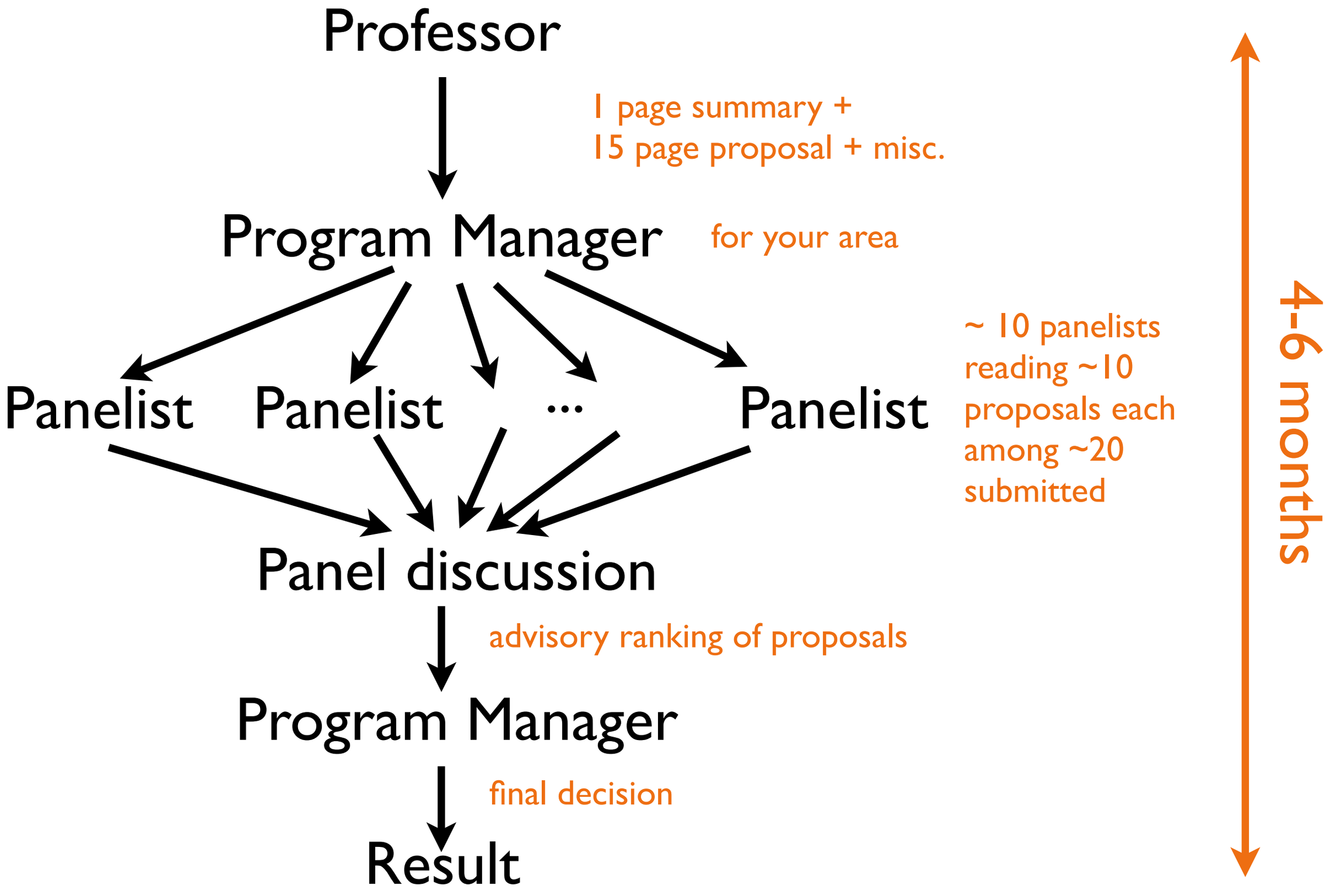
- Larger collaborative groups
- Due mid-fall each year (in CNS)

Common NSF grants

CAREER: $400-500k over 5 years

- One early-career PI
- Three chances
- Deadline varies by area (summer)
- Significant emphasis on education component
- Considered prestigious, important for tenure

The NSF Review Process



High level advice

Do you believe in this?

- Will your work really improve peoples' lives or understanding? Or is it just some papers?
- Do you have a realistic chance of achieving your goal?
- Will you personally be fulfilled after working on this project for 3-5 years?
- Will you find students who are excited to work on this for multiple years out of their life?

Biggest value of writing a proposal is forcing you to think about long-term impact.

High level advice

Do you believe in this?

Tell a story

- Not just a collection of disjointed problems
- Articulate cohesive mission in one sentence
- Work towards the mission in components of proposal
- Keep proposed work focused (more ≠ better)

High level advice

Do you believe in this?

Tell a story

Confront related work in depth

- Don’t try to hide related work
- Demonstrate understanding and clearly address differences

High level advice

Do you believe in this?

Tell a story

Confront related work in depth

Be specific in proposed work

High level advice

Do you believe in this?

Tell a story

Confront related work in depth

Be specific in proposed work

Get feedback!

- Especially the introduction
- Start early

NSF proposal anatomy

Summary	1 page
Introduction	2-3 pages
Background / Related	2-3 pages
Proposed work 1	6-9 pages
...	
Proposed work *n*	
Education, work schedule, past results	~2 pages

Summary

Compressed version of Introduction

Required to describe

- Intellectual merit: "potential to advance knowledge"
- Broader impacts: "potential to benefit society and contribute to the achievement of specific, desired societal outcomes"

Introduction

My rough outline

- Context and importance of the problem
- Why it is not solved by past work
- **One-sentence mission statement**
- Approach to accomplish the mission
- Why the approach is different than past work
- Specific proposed work

- Intellectual merit
  - Summary of contributions, maybe integrated w/above
- Broader impacts
  - Real-world code use, data, education, ...
- PI qualifications

Background

Related past work

- Thoroughly explore past work in preparation (one of the most time consuming jobs in preparing a new proposal)
- Organize into major approaches
  - Hopefully you introduce a significantly new approach
- Clearly describe each past work and why your approach is different and more promising

Your own past published work

- Highlight published past work here
  - Save unpublished preliminary work for later
  - i.e. clear separation with *done* vs. *proposed*
- Advertises your cred and potential of the direction

Proposed work

Clearly identify what is the proposed work

- Put it in section title
- Separate from your past work

Clearly identify what you are going to do

- Highlight specific contributions for the busy panelist (== all panelists)
- Then go into detail

Scope of proposed work

Mix of risk

- Some with preliminary results
- Some longer-term
- Some ambitious, might fail

Tough balancing act...

- It's groundbreaking yet will definitely succeed!
- It's new research but I've already shown I can do it!

Scope of proposed work

Tough balancing act...

- I have failed in both directions:

"Contrary to what the proposal states, I do not see the beginnings of [the research result] in this proposal."

"The idea of [research area] is novel and creative, however, that is previous work."

Education initiatives

How much emphasis?

- Less than the research initiatives
- But always given some weight
- In CAREER, given significant weight – take it seriously!

Content

- Connect with research if possible
- Courses, outreach, survey papers, ...
- As always: Write only what you believe in

Work schedule

The famous Gantt chart...

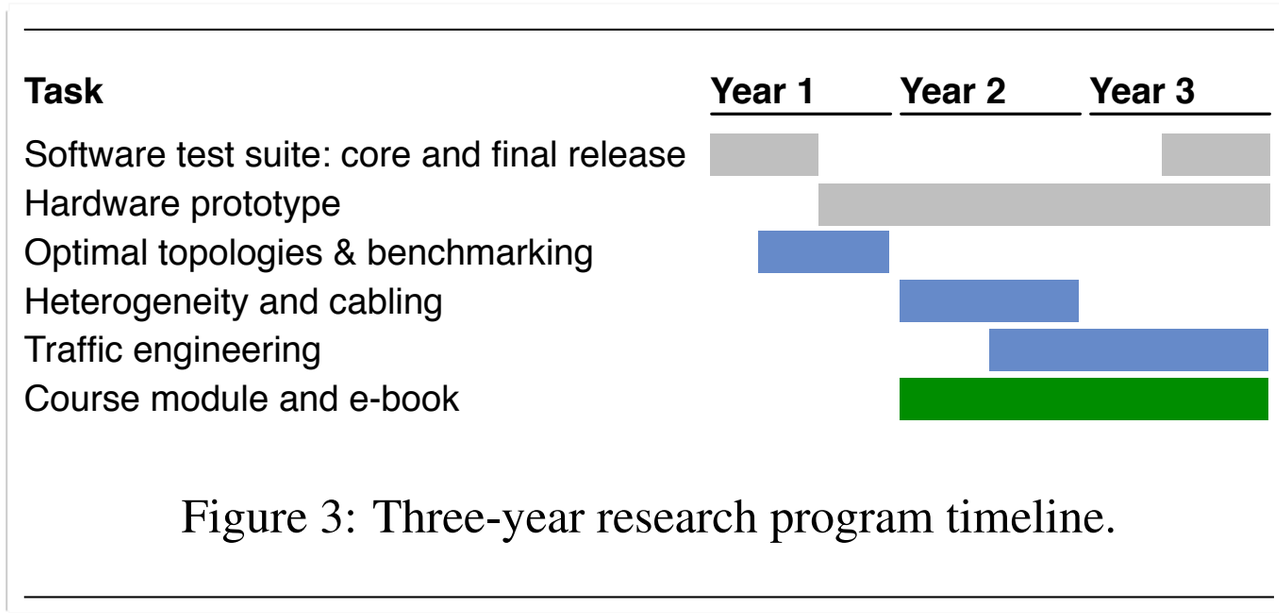


Figure 3: Three-year research program timeline.

Results of past NSF support

Not much, if you're first-year faculty...

Questions you might have.....

How can I have novel education initiatives?

Should I serve on a panel?

What is the target audience (panel composition)?

What happens after I submit?

How should I balance preliminary & new work?

Should I get letters of support/collaboration?

What's the right volume of work to include?

Final disclaimer

Advice here is what has often worked for me

- In the area of Computer Science networking & systems
- Expectations vary across areas and fields
- Other styles of writing seem to work for other people

And there are never guarantees

- I've ceased trying to predict whether a grant will be funded (or whether a paper will be accepted)
- Best you can do is the research you truly believe in – and make sure your beliefs are based on careful thought