Developing an NSF CAREER Proposal

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Outline

• Program orientation vs. research project
• Clear and cogent problem statement
• Prior work helps
• Be aware of the time schedule
• Talk to the program manager first
• Proposal structure and writing tips
• Finding help
• When are you ready to submit your proposal?
Program orientation

• Five-year program of research and education
• CAREER is an *integrated program of research and education*
• Different from the usual NSF solicitation
  – Not for a specific research project
• You will need to articulate a research and education agenda
  – Select an area of work in your field that needs work
  – Describe *several* interrelated research problems that need to be solved in the area
  – Describe some related education and training problems that need to be solved
Selecting a Research and Education Area

• Pick a compelling problem that has broad impacts and effects that are tangible
  – Integrated research AND EDUCATION program
  – Funds your activity in a research area, not to solve a specific research question as you did for your dissertation
  – Should build on your expertise and provide a research and education plan for the next five years.

• Think about developing a research agenda and program
  – More than a specific research problem
Education

• Integration of research and education is a critical aspect of the proposal
  – Plan your education component and how to integrate your research component with education
  – Integrate the results of your research into your courses
  – Research is not 100% of your job as a faculty member

• Think about what your job is as a faculty member
  – Discovery aspect which you are very familiar with from your dissertation
  – Education aspect should build on your education, AND bring in your discoveries from your research work
Education

• Think of education as another kind of discovery activity
  – Part of your job as a faculty member
  – Look at your education program as a deliberate discovery process

• Just as you pursue research, also pursue a coherent and cogent education program
  – How do your courses fit within the curriculum in your department?
  – Publish your education results in appropriate education venues such as ASEE
  – In your minibio explicitly list your research and education papers
Articulating the problem statement

• It is essential to express a clear, cogent, and compelling problem statement
• You should be able to describe the problem in one clear and compelling paragraph
  – Not easy to do well
  – Requires a lot of thinking about how to express your problem
  – Think of this as the ‘elevator pitch’ for your proposal
• *What is the problem, and why is it an important problem?*
• Ask colleagues with a CAREER award to review your program
• Develop a strategy on how to approach the writing
  – Robert Boice *Advice for New Faculty Members*
    • “Write in Mindful Ways”. schedule time to write every day
• Develop your own “voice” within a clear structure and framework
• Use specific aims, objectives, and goals
Build on your foundation

• Build on your past experiences, skills, and strengths

• Education
  – Focused on Physics, Math, Computer Science & Engineering
  – B.S. in Physics (Math minor); B.S. in Computer Science (Oakland University in Michigan)
  – M.S., Ph.D. In Computer Science & Engineering (University of Michigan)

• Work Experience
  – Software Development, Systems (OS and Networking), Research in developing and deploying HPC and Cyberinfrastructure
  – Software Engineer, Systems Administrator, Manager / Director of HPC groups (Oakland U, StorageTek, University of Saskatchewan, University of Michigan, Indiana University)
  – Research Assistant Professor (Purdue University)
  – Assistant Professor/Associate Professor (Purdue University)
Prior Work

• Prior published work in the research area is helpful
  - Journal articles are best
    - Refereed high impact conferences are also good
• Demonstrates to reviewers
  - Your work in the area is publication caliber
  - Demonstrated ability to conduct research in the area
• Leverage your established courses and labs
  - Demonstrates momentum in education and courses
  - Describe your lab facilities in proposal or as an supplemental document
Be aware of the time schedule

- Work backward from the RFP due date
  - Begin as soon as possible
  - Plan to submit before the due date
- You may need to stop and rethink your approach — don’t be afraid to go back to the beginning and overhaul your framework if it doesn’t seem to fit the CAREER program
- CAREER Proposal Development Schedule
  - Publish prior work
  - Develop research and education agenda
  - Talk to Dept. Head and colleagues
  - Pitch idea to NSF program manager
  - Develop budget
  - Write proposal
  - Submit proposal
- Quality work takes time
  - Don’t waste one of your chances
    - Only submit your very best work
Talk to the program manager early in the process

• Find the NSF directorate that is the closest match to your research area and interest
• You can visit in person, but phone call is OK
• Plan sufficient time to arrange schedules
  – Months not days

• Process
  – Email program manager to introduce yourself and request an appointment for a phone call or visit (at least 30 min) to discuss your CAREER proposal
  – Pitch your idea
  – **LISTEN** and take good notes
Finding a Mentor

• Experienced senior faculty who can give you feedback on the proposal
  – I had a member of my college who used to work as an NSF program manager
  – He is also a senior faculty member at Utah State with many years of experience running a research program

• Refine your “elevator pitch” and try it with your mentors and colleagues to polish it
  – You should be able to convey your idea in a couple of paragraphs
Proposal structure and writing tips

• Research and education agenda
  – A well-defined set of research and education problems you propose to address
  – Leads to a set of objectives

• Objectives
  – Numbered list of research and education activities
  – Each activity addresses problems posed in research and education agenda

• Specific Aims
  – Numbered list of specific aims for each objective
  – Provide very specific details on what you propose to do
  – If you have prior work in the specific aim (published or unpublished)
    • Describe your results and how you will apply and extend the work

• Expected outcomes for each specific aim
  – What will be the impact of the work for a specific aim on the problem?

• Timeline
  – Describe a timeline and milestone for each specific aim
Proposal structure and writing tips

- **Budget**
  - Be realistic
  - Minimum is $400K ($500K Bio)

- If you ask for $1M, be prepared for budget negotiation
  - Program Manager may ask what you can accomplish with < $1M

- If you budget for minimum + small delta
  - Less chance that you will need to reduce your budget
Proposal structure and writing tips

**The first paragraph in your proposal is very important**

- Captivate reviewers to read the rest of your proposal
  - Reviewers read many proposals
    - Make reading your proposal a valuable use of their time
    - Helpful to learn about problem areas from reading proposals
Proposal structure and writing tips

• Summary page very important
  – Treat it as an executive summary
  – Describe the research problem, your objectives, and the expected outcomes of your proposed work

• Don’t forget to leave room for intellectual merit and broader impacts
  – Mark them clearly in your project summary, e.g.:

    * Intellectual Merit:
    * Broader Impacts:

• Data management plan is required
  – E.g. Purdue PURR

• New NSF GPG requirements for Results from Prior Support
  – Jan 2013 – new GPG (GPG13001)
  – Address Intellectual Merit and Broader Impacts from prior support
Finding Help

• Google
  – “NSF CAREER” returns 9,230,000 results

• NSF CAREER Proposal Writing Tips
  – http://www.clarku.edu/offices/research/pdfs/NSFProposalWritingTips.pdf

• Ask a senior colleague to read your proposal and provide feedback
  – Ask them to read it as though they were a reviewer
  – Carefully address each comment
When are you ready to submit your proposal?

• Have you performed all of the steps?
  – Publish prior work
  – Develop research and education agenda
  – Talk to Dept. Head and colleagues
  – Develop budget
  – Pitch idea to NSF program manager
  – Write proposal

• Don’t send in your proposal until you are 100% satisfied that it is your best effort
  – There is memory in review panels and reviewers
  – You will need to address comments from prior years’ review
  – Don’t submit incomplete product