2018 UNM NSF CAREER Proposal Workshop

FACULTY RESEARCH DEVELOPMENT OFFICE
UNM CAREER Success
57 projects have been awarded to UNM since 1995

NSF CAREER Awards at UNM since 1995

Number of Awards

0 1 2 3 4 5 6 7 8 9

ACI  CCF  CNS  IIS  AGS  EAR  OCE  OPP  CBET  CMMI  ECCS  EEC  DEB  EF  IOS  MCB  DBI  DRL  HRD  DUE  DGE  AST  CHE  DMS  DMR  PHY  BCS  SBE

Computer & Information Science and Engineering (CISE)

Geosciences (GEO)

Engineering (ENG)

Biological Sciences (BIO)

Education and Human Resources (EHR)

Mathematical and Physical Sciences (MPS)

Social, Behavioral and Economic Sciences (SBE)
2017 CAREER Funding Rate

- CISE – 24.0%
- GEO – 24.5%
- ENG – 14.5%
- BIO – 12.0%
- EHR – 8.5%
- MPS – 22.0%
- SBE – 14.5%

Average funding rate – 17.14%
Rob Miller, Professor of Biology

- CAREER PI 1996
- NSF BIO Program Director 2007-08
- NSF Deputy Division Director 2015-2017
  - Acting Division Director most of the time
- Reviewer service, lots
- Panel service, numerous
Some advice

• Propose an Education Plan that you would want to do.
  – Would you do it even without the CAREER?
  – Don’t saddle yourself with something you don’t want to do just because it sounds cool.

• Is there necessary support for the plan?
  – Chair’s letter, institutional awareness and support
  – Are financial needs in your budget?
Some advice

• Take advantage of your local setting
  – Hispanic/Minority Serving Institution
  – Southwestern US
  – Institutional Strengths

• Your own experiences
  – Tell the Reviewers and Program Officers why you want to do this
  – What need to you see?
Some advice

• An Education Plan doesn’t have to be novel to be successful
  – BUT it is a highly competitive program
  – Taking advantage of existing education/outreach programs that are effective works

• The Science still matters (A LOT)
  – Integration is desirable
  – But a great education plan won’t compensate for science that the NSF program doesn’t prioritize for support.
Pay attention

• To what NSF is prioritizing

• The Ten Big Ideas
  – They matter
  – Demonstrate that you are paying attention

• How does what you are doing relate?
Arash Mafi
Director of Center for High Technology Materials (CHTM)
Associate Professor of Physics & Astronomy
NSF CAREER Proposal Writing Tips

• There’s no secret formula! Just do your best.

• Attend an NSF Review Panel
  • Contact your program manager, tell them you are a new faculty, and ask them to invite you to a panel.

• Balance between the technical and educational parts?
  • You need to be very strong on the technical part.
  • You need to be at least adequate on education and outreach (try excel in this part as well).

• Innovation in education!
  • Occasionally you find panels that reject your proposal if they find your education/outreach too ordinary and not innovative.
  • Have at least one prominent innovative component.
NSF CAREER Proposal Writing Tips

• My proposal: 3 pages introduction, 9 pages technical, 3 pages education/outreach.

• Don’t forget the Assessment, especially in education.

• Collaboration letters are OK! Make sure to maintain your independence.
  • You need to clearly state that you can do it all independently, even if you collaboration does not materialize.

• Don’t get too technical.
  • Most people on the panel are NOT experts in your area.
  • Don’t dumb it down too much.

• Make sure a senior colleague reviews your proposal.
  • Only someone who has a strong NSF track record.
  • Carefully listen to their advice (make your own judgment).
NSF CAREER Proposal Writing Tips

About 1,910,000 results (0.53 seconds)

NSF CAREER Proposal Writing Tips - Columbia Center for Teaching ...
https://ctl.columbia.edu/ctl2/.../NSF-Career-Award-Writing-Tips-2211ro6-1oqiqnn.pdf
by ZJ Pei - 2007
Preface. The main purpose of this book is to provide some tips to the assistant professors who plan to write their NSF CAREER proposals. The idea of editing this book originated during a conversation with Dr. George Hazelrigg, (program director at National Science Foundation) when I visited him late November, 2006.
Trilce Estrada
Assistant Professor
Department of Computer Science
University of New Mexico
http://cs.unm.edu/~estrada
My Background

BS in Informatics from Universidad de Guadalajara, Mexico

MS in Computer Science from INAOE, Mexico

PhD from University of Delaware
My Research

In-situ analysis, distributed learning, and data representation for scientific and medical applications
Started this journey at the 2009 CRA-W Workshop on Career Planning

First time I heard of the CAREER, but what I heard was important:

• It is not just about one project, it is about your research program
• Teaching and research are both important, make sure to integrate them as best as possible
Participated at the SC12 Broader engagement program

Years later this would be important
Joined UNM

- UNM is a Carnegie R1 and HSI/MSI
- 55.7% of the undergraduate students are from ethnic minority groups
- Privileged closeness to SNL and LANL
Participated at my first NSF panel

- How are proposals structured?
- What do reviewers discuss?
- How easy is it to get your message lost in the minutiae?
- How important it is to follow the solicitation?
- What other things are useful to include?
Two things happened:

1. Saw my PhD advisor
2. Got energized
   - New ideas and problems
Ok, here we go!!
but where?
• Figure out where do you fit in the current research landscape
• Leverage your expertise
  – New direction, but not so new that you don’t have the expertise
• Discuss with colleagues
• Get examples of other proposals

Ok, here we go!!
but where?
World Cup 2014

2009
CRAW Career workshop
CAREER?

Nov, 2012
Supercomputing
Work exposure

Aug, 2013
Joined UNM

Mar, 2013
First NSF panel
What is all this about anyway?

May, 2014
IPDPS
Problems + Ideas

June 01, 2014
OK, here we go!
But where exactly?

Jun 12, 2014
World Cup
Soccer + writing
World Cup 2014

- June 01, 2014: World Cup
- Jun 12, 2014: World Cup

Focus and Motivation
- Identified the specific research challenges that I wanted to pursue
- Identified specific outcomes and milestones
- Identified a way to combine research and teaching with community involvement
- Identified long term goals
2009
CRAW Career workshop
CAREER?

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OK, here we go!
But where exactly?

Jun 12, 2014
World Cup
Soccer + writing

Jun 29, 2014
Then this happened
Rethinking plan of action

2012

2013

2014

2 - 1

NEDERLAND

MEXICO
For each contribution:

- **Description**
- **Evaluation and outcomes**
- **Broader impact**
- **Prior work**

Rethink the plan of action: better organization

- Date: June 01, 2014
  - Event: OK, here we go!
  - Details: But where exactly?

- Date: Jun 12, 2014
  - Event: World Cup
  - Details: Soccer + writing

- Date: Jun 29, 2014
  - Event: Then this happened
  - Details: Rethinking plan of action

- Date: Mar, 2013
  - Event: First NSF panel
  - Details: What is all this about anywat?

- Date: Aug, 2013
  - Event: Joined UNM

- Date: May, 2014
  - Event: IPDPS
    - Details: Problems + Ideas

- Date: May, 2014
  - Event: Supercomputing
    - Details: Work exposure

- Date: Nov, 2012
  - Event: CRAW Career workshop
    - Details: CAREER?

- Date: 2009
  - Event: CAREER?
Get feedback from both, senior and junior colleagues

- Be more concrete
- Give a quantitative example
- Explain in plain terms why this is important
Final draft, submitted just hoping to get initial feedback

To contact or not to contact NSF Program Director?
Final draft, submitted just hoping to get initial feedback, got funded!!

Fight for each ball, you never know what might happen if you try
trilce@unm.edu
Quantum Measurements for Optical Communications

How efficient can communication be?
What are the physical limits in comm.?

- Photons from lasers

Coherent States: Nonorthogonal

Discrimination
Unavoidable Errors

Quantum Noise

ON-OFF detection
PNR detection
QNL
QNL

Transmitter
Receiver

Communications

Light

Transmitter
Receiver

Channel
Proposal History

(Postdoc project)

- **Fall 2013:** UNM research plan: build on this work

- **11-2013:** Applied to Dir. of Engineering (NSF)
  Sent to crossdisciplinarity review panel:
  *Quantum, Mol. and High Perf. Model and Sim. for Devices and Syst.*

- **05-2014:** Denied
  **Ratings:** V, V/G, V/G, G, G; CCSS: E, G, G
  - ...“(panel) viewed (the proposal) as somewhat incremental, a continuation of the PI’s previous work as a postdoc”...
  - ...“broader impact discussion is very short, and educational and outreach components are completely absent”...

  **Suggestions**...“PI participates in workshops on writing proposals (including CAREER) to meet NSF’s expectations. ”...

**Plan:** Get prelim data and Broaden the scope of work
Project to build career (think beyond 5 years)
- Had prelim results
- Broaden scope of science
- Include broader impacts and educational component

Preparing and application
READ & THINK GUIDES AND EXAMPLES (NSF online)
  - “NSF CAREER Proposal Writing Tips”
  - “Writing A Winning CAREER Proposal” ... many more...
Credible/doable 5-year plan, but yet groundbreaking science...(no trivial)

What to (and not to) do...
• Write clearly (zero-jargon): Reviewers may not be experts
• Think of it as a lifetime project: career development
• Propose things that you want to do
• Get people to read it: experts and no experts
• Submit on time to UNM:
• Do not make changes at the last minute
CAREER: prepare and submit

- **07-2016**: Applied to CAREER (NSF)
  - Make sure your proposal goes to the correct (intended division)
  - Budget asked about $750 K

- **10-2016**: Requested reviews to NSF to submit to another (NSF)
  - 11-2016 Got response: not recommended but (PM) wanted to defer decision until January, 2017. Rating: E, VG/G, VG, VG
  - I submitted to another program

- **01-2017**: Call and message from NSF
  - CAREER recommend that it be supported at the level of $100,000/yr for 5 years
  - Re-budget and resubmit
  - Grant started **April 27, 2017**.
CAREER proposal: Science

Components

Current research
• Prelim data
• Prelim theory

New research
• Some prelim theory
• solve current problems (optical and quantum comm.)

Newer/paradigm shifting research
• Ideas of superadditivity
• Very difficult and futuristic
• Groundbreaking impact in communication and information theory

Broader impacts (Vision)
• Impact in current technologies?
• How would change current fields?
• Which other fields would open?
CAREER proposal: Education (4/15 pgs.)

**Motivation and Justification**
(Why? And Why me?)
- There is a real need
- It can make a real impact at (UNM)
- I know the course very well
- I know the problems, I have a plan
- I believed I can make a real impact
- I Want to do it

**New experimental components to existing curricula**
- 5 experiments across 3 courses
- Undergraduate and graduate education
- New tracks in join academic programs (physics and engineering)

**Use experiments to integrate undergraduate in research**
- Portable source of entangled photons
  (undergraduate research)
  - Teaching labs
  - Research in my lab

Experiments
- Atomic
- Optics
- Lasers
- Quantum mechanics/optics
Applying for the NSF CAREER: Personal Perspectives

Zhen Peng
Electrical and Computer Engineering Department
University of New Mexico
E-mail: pengz@unm.edu
April 26, 2018
ABOUT ME

• Started as an Assistant Professor at the Applied Electromagnetics Group in the Electrical and Computer Engineering Department in Aug. 2013

• Applied NSF CAREER twice:

  • 2016: ECCS - CDS&E, ECCS - COMMS, CIRCUITS & SENS SYS (Competitive - The research plan includes a large scope that may be consolidated for better focus.)

  • 2017: ECCS - COMMS, CIRCUITS & SENS SYS

• Other award NSF project: 2015 CCF/AF, 2016 CCF/AF SUP
MY RESEARCH BACKGROUND

Computational and Applied Electromagnetics

² Supercomputing-enabled design-through-analysis paradigm
² Scalable computational algorithms, domain decomposition methods
² Multi-physics and multi-disciplinary model and simulation
² Computational Electrodynamics with machine intelligence
• New research directions, focused, and innovative

• Think about the 5-year and 10-year plan, and how does the proposed work support the long-term plan

• Develop the idea, why are you the person to investigate the problem

• My long-term career goal: use computer simulation to perform virtual experiments that replicate large-scale electrodynamic systems. These simulations will enable prediction and discovery of new phenomena, allow for the design and optimization of complex systems at unprecedented scales, and contribute through education to the advancement of understanding.

• In pursuit of my long-term goal, the research objective of this CAREER proposal is to investigate new fundamental mathematical models and computational algorithms for the statistical wave analysis in complex electromagnetic (EM) environments.
Virtual reality electromagnetic laboratory, which offers a multifaceted teaching and learning environment through innovative data visualization and interactive simulation. The lab will utilize virtual reality (VR) data visualization to visualize various EM sources, fields, waves, and their interactions with environments.
• Attend NSF Career workshop, **2016**

• Serve on NSF panels and review proposals, **three times**
  
  • Help to understand the review process

• Get to know your program director/directors

• Discuss with your research ideas with several PDs (early)

• Program director may recommend your proposal to the most relevant program
• Got a mentor to help guide my progress (Christos Christodoulou, Edl Schamiloglu)

• Discuss proposal ideas, specific plan, big impact …

• Read your proposal and give you feedbacks

Department letter is Important!
A description of
a) the relationship between the CAREER project, the PI's career goals and job responsibilities, and the mission of his/her department/organization
b) the ways in which the department head (or equivalent) will ensure the appropriate mentoring of the PI, in the context of the PI's career development and his/her efforts to integrate research and education throughout the period of the award and beyond
• The NSF CAREER review panel consists of well-know professors in the society

• It is good if they know you and your past work

• Attend conferences, talk to your colleagues in the conferences, introduce your work …
Thanks & Good luck!

Email: pengz@unm.edu
Ramesh Giri
ASSISTANT PROFESSOR
DEPARTMENT OF CHEMISTRY AND CHEMICAL BIOLOGY
**NSF Emphasis Area and the Reviewers’ Take on the Proposal**

New NSF Emphasis Area in the NSF-wide SusChEM (SEES) initiative
“Fundamental research topics of interest in SusChEM include:
replacement of rare, expensive, and/or toxic chemicals with earth-abundant,
inexpensive, and benign chemicals”

Proposed Work: Not Funded Twice! (Based on Reviewers’ Comments)

| TITLE OF PROPOSED PROJECT | SusChEM: CAREER: Development of Cross-Couplings with Base Metals |

Importance of the proposed work: Nobel prize 2010 but requires rare and expensive metal Palladium
Base metals (copper): unsolved problems, Other people actively working: MIT, Caltech, Berkeley

Consulted with NSF Program Director
Advice – “Do Something New and make Outreach strong”

Change of Plans – Something New and Strong Outreach – Funded!

What I Learnt? – Needs to keep a balance between what the NSF emphasis area is and what the reviewers (the community) want to see and like!
How Does Outreach Help the CAREER Proposal Get Funded?

Excellent Proposal with Weak Education/Outreach Brings Down Overall Rating = Decreases Chance of Funding

Good Proposal with Excellent Education/Outreach Brings Up Overall Rating = Increases Chance of Funding

Strong Outreach Makes a Regular Proposal Strong!

High School Students/Teachers in New Mexico
UNM/REU Undergrad. Students
Scientific Publications

Community Outreach Lectures/Demonstrations
Giri Research Program
Presentations
Research Training
UNM Graduate Students

provides research and classroom opportunities to high school, undergraduate, and graduate students in NM in an integrated approach (Figure 2).

Figure 2: Proposed integrated educational and outreach efforts

Figure 3: PI presenting ideas about involving HS students in research in a meeting with officials at South Valley Academy (04/29/2015).

Be Creative to Integrate Research with Education/Outreach
How Much Money to Ask for?

Ask as Much as You Need but **Clearly Justify it**!
Talk to Your Program Officer (Director)

My Fearless Friend Asked for $900K
When NSF Decided to Fund the Proposal:
20% Cut = 720K

I the Weakling Asked for $768K
When NSF Decided to Fund my Proposal:
12% Cut = 675K

Fearless Friend:
Asked for Equipment by Justifying It’s Need in Education/Outreach Efforts

I Got 45K Less than my Friend!

CombiFlash
Good Luck!

I Hope You will Join the NSF CAREER Awardee Club Soon!
Career Awardee Panel Discussion

ROB MILLER, ARASH MAFI, TRILCE ESTRADA, RAMESH GIRI, FRANCISCO ELOHIM BECERRA, ZHEN PENG
In Summary...

- Think Program not Project
  - 10-20 year plan with first 5 fully funded
- Clearly Integrate your Research and Education
  - Find out where your research fits within NSF, national, and global priorities
- Develop an Education Plan you want to and can do
- Assessment/Evaluation is important
- Find reviewers (expert and non-expert) (UNM and external) to read proposal and provide feedback
- Get experience with the NSF before submitting to CAREER
  - Prior NSF Support
  - Review Panels
  - Talking to Project Manager
Resources for Early Career Investigators
Our Mission

The Faculty Research Development Office (FRDO) works in close collaboration with other units of the Office of the Vice President for Research (OVPR) and with research administration personnel in colleges and departments to enable faculty to obtain external funding. FRDO also helps to implement campus research initiatives.

Submit a Request for Proposal Support

CORE SERVICES

ASSIST WITH LIMITED COMPETITIONS
COORDINATE WORKSHOPS AND SEMINARS
ADMINISTER OVPR RESEARCH INITIATIVES

View Limited Competitions
View all Workshops
View Faculty Support Initiatives

PROPOSAL PLANNING & EDITING SUPPORT
SUPPORT EARLY CAREER INVESTIGATORS
HELP WITH FUNDING SEARCH

Learn More About These Services
Find Out More
View External Opportunities

Resources for Early Career Investigators
Early Career Investigators at UNM

- Subsite off main frdo.unm.edu site devoted to early career investigators
- Relevant, searchable articles
- Early career specific funding opportunities
- Workshop archives and early career specific resources
- News archive (in the works) celebrating early career awards
2019 NSF CAREER Cohort

- Peer Support + FRDO Facilitator
- Fully understanding CAREER expectations
- Scheduled guidance to keep everyone on track starting this Fall
- Team building – helping everyone succeed
- Whole group + one-on-one meetings as needed
- Contact Stephanie Tofighi if you’re interested in joining.
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|             | • Share a rough draft with readers (non-expert & expert)              |
|             | • Start working with department FRSO or administrator to develop proposal |
| D – 5 weeks | Polished draft to readers (non-expert & expert)                       |
| D – 3 weeks | Chair should have your draft proposal including their department letter and your CV |
| D – 2 weeks | Proofreading of proposal by readers (non-expert)                       |
| D – 5 days  | Route your proposal with final budget and other non-technical pieces + drafts of technical pieces |
| D – 2 days  | OSP should have your final proposal                                    |
| **Due Date**| NSF has your proposal                                                 |
## CAREER Proposal Timeline

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