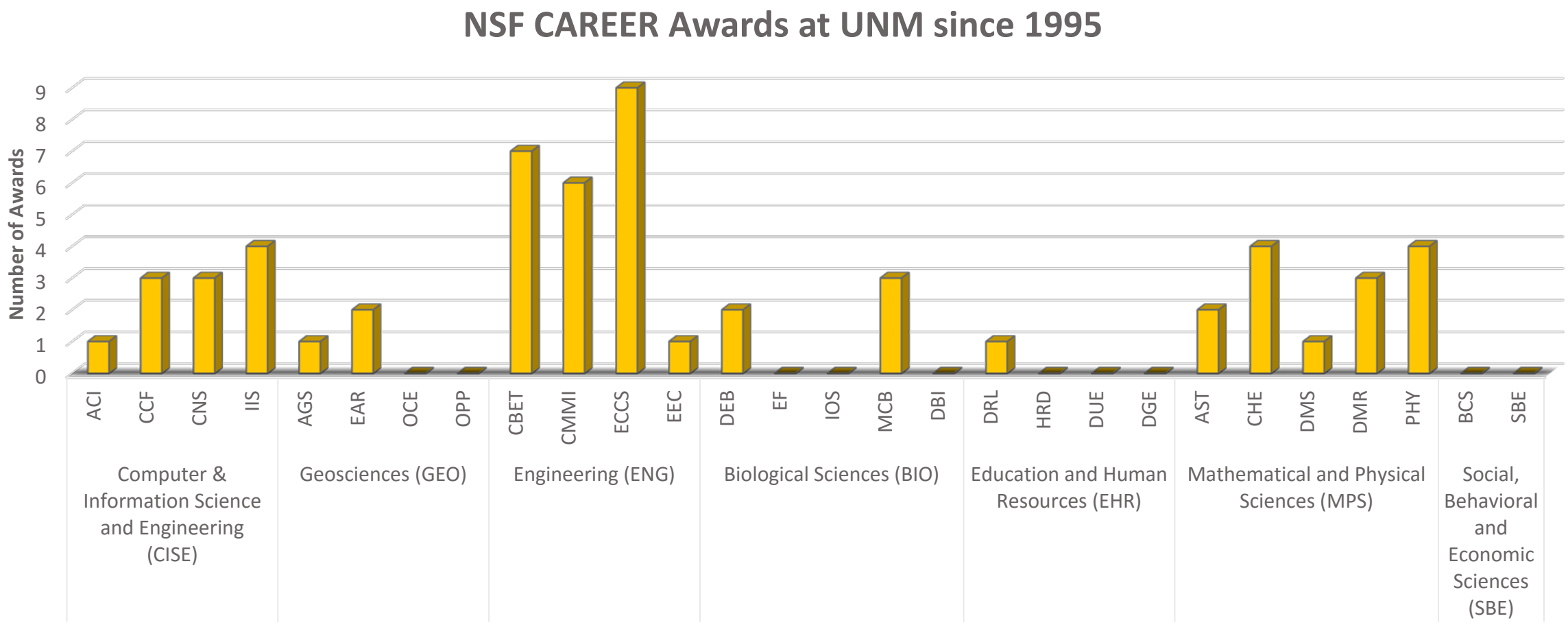
2018 UNM NSF CAREER Proposal Workshop

FACULTY RESEARCH DEVELOPMENT OFFICE

UNM CAREER Success

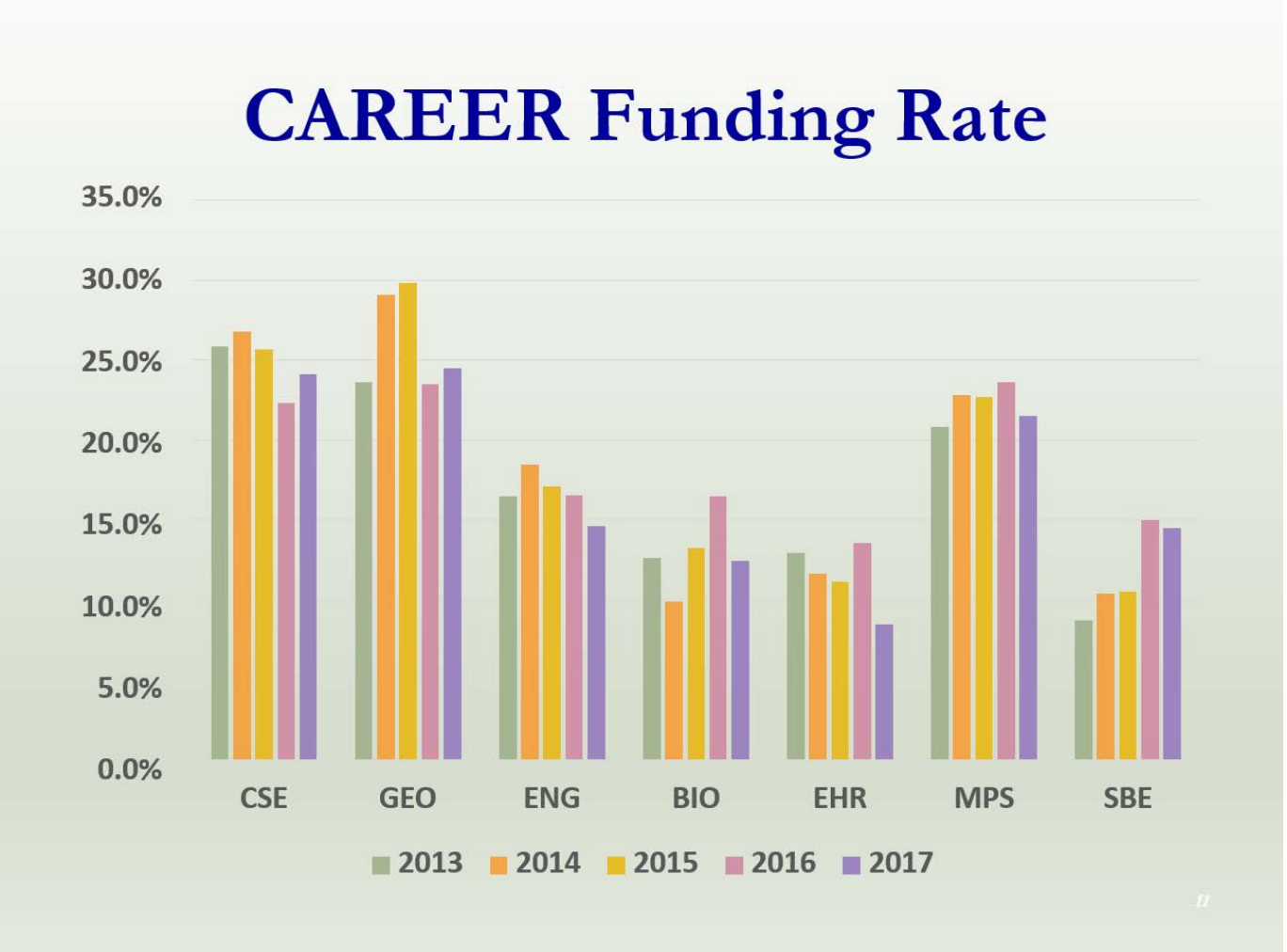
57 projects have been awarded to UNM since 1995



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 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

NSF CAREER Proposal Writing Tips

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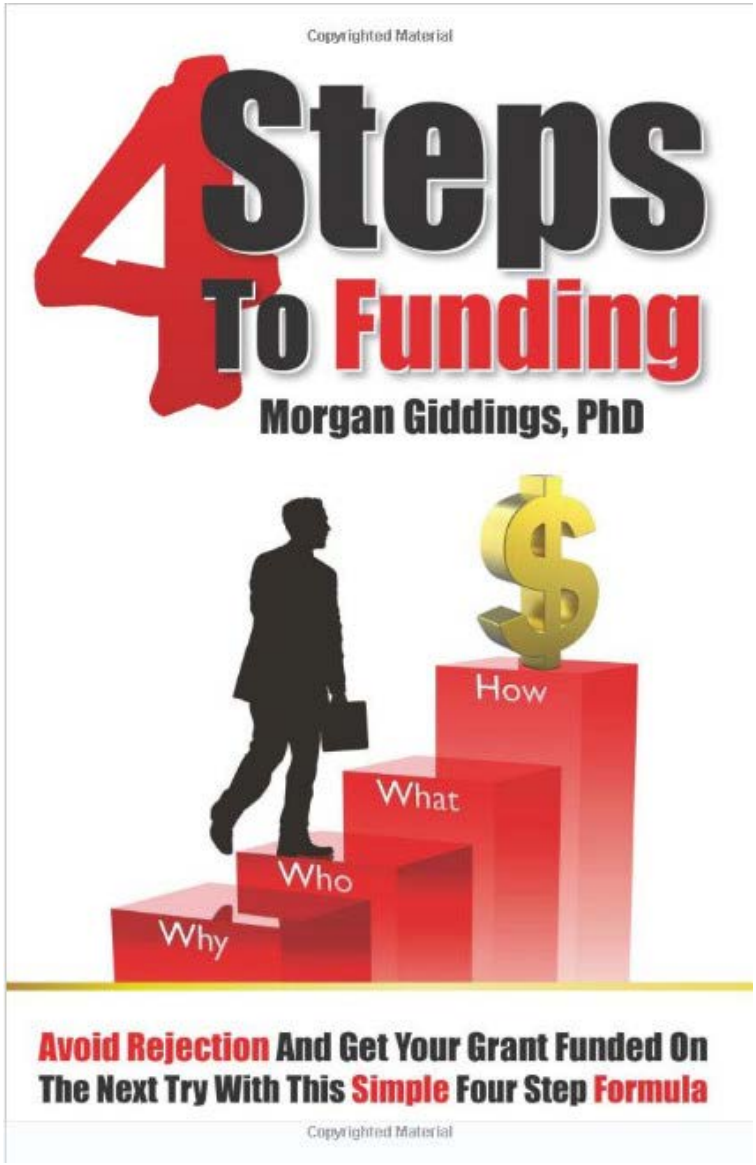
NSF CAREER Proposal Writing Tips - Columbia Center for Teaching ...
https://ctl.columbia.edu/ctl2/.../NSF-Career-Award-Writing-Tips-22l1ro6-1oqiqnn.pdf
by ZJ Pei - 2007
Preface. The main purpose of this book is to provide some **tips** to the assistant professors who plan to **write** their **NSF CAREER 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.



THE UNIVERSITY OF NEW MEXICO

Trilce Estrada

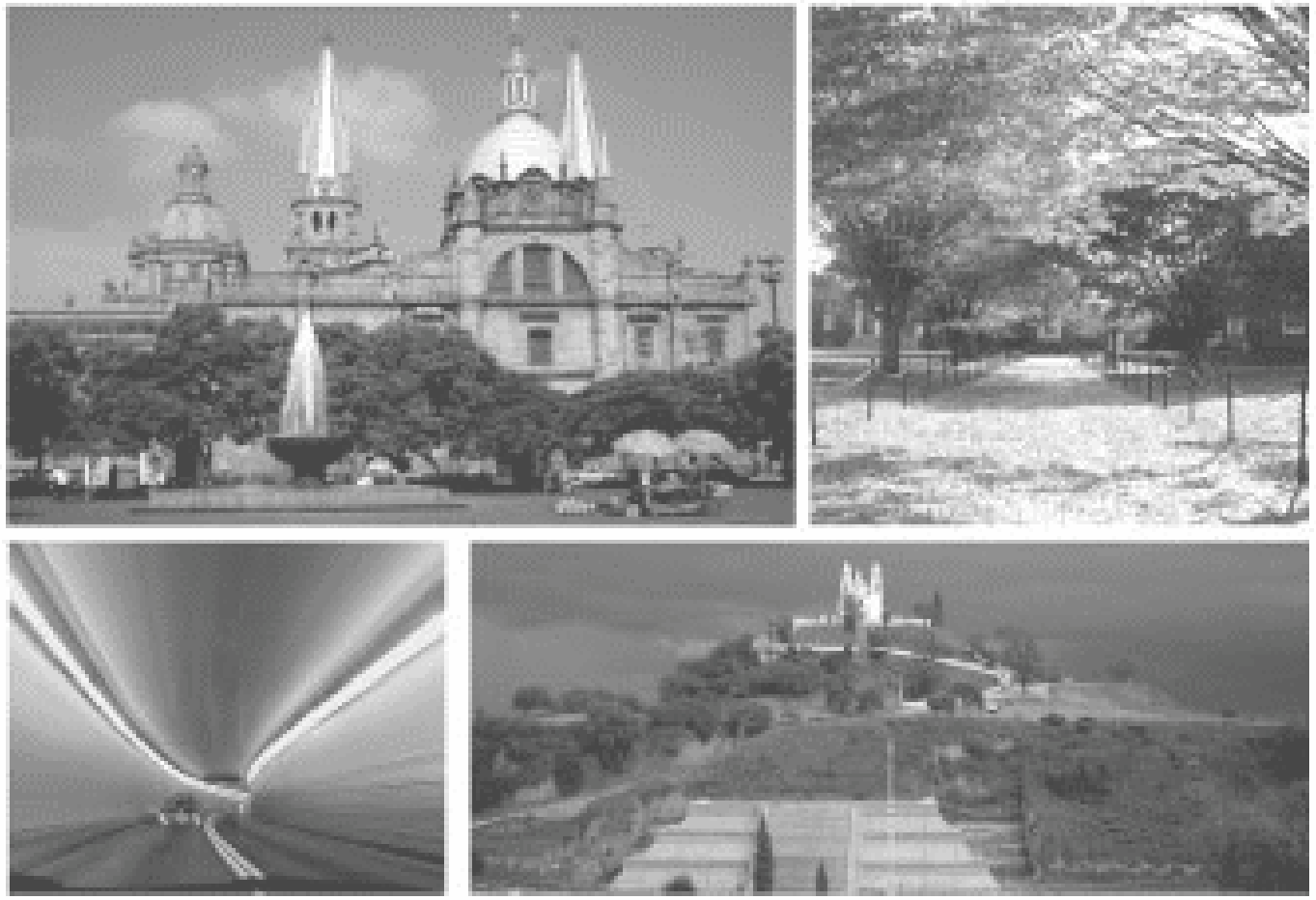
Assistant Professor

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

2009 — **CRAW Career workshop**

CAREER?

Nov, 2012 — **Supercomputing**

Work exposure

Participated at the SC12 Broader engagement program

Years later this would be important

2009 **CRAW Career workshop**

CAREER?

Nov, 2012 **Supercomputing**

Work exposure

Aug, 2013 **Joined UNM**

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

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?

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?

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What is all this about anywat?

May, 2014 — **IPDPS**

Problems + Ideas

Two things happened:

1. Saw my PhD advisor
2. Got energized
   - New ideas and problems

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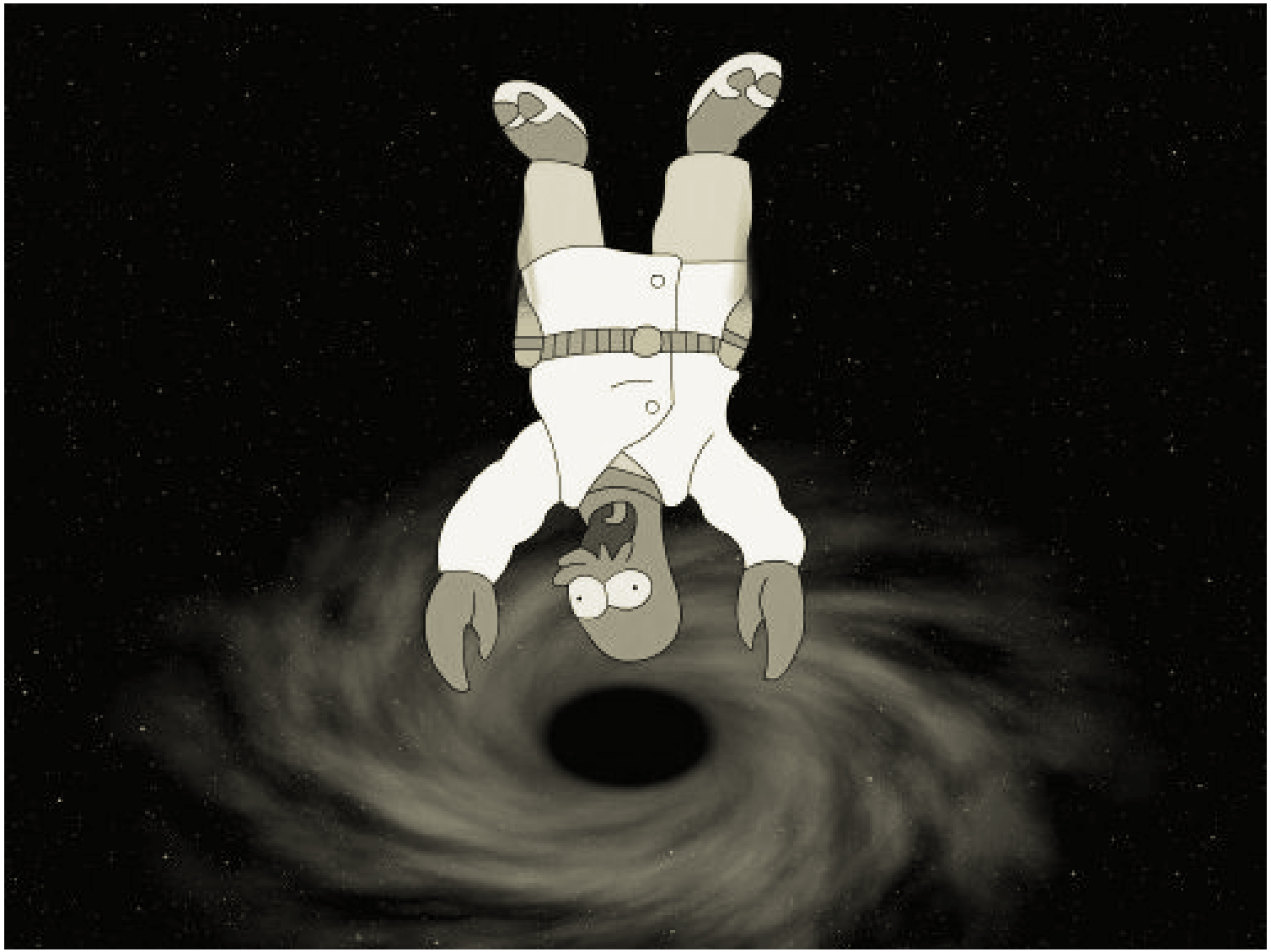
Problems + Ideas

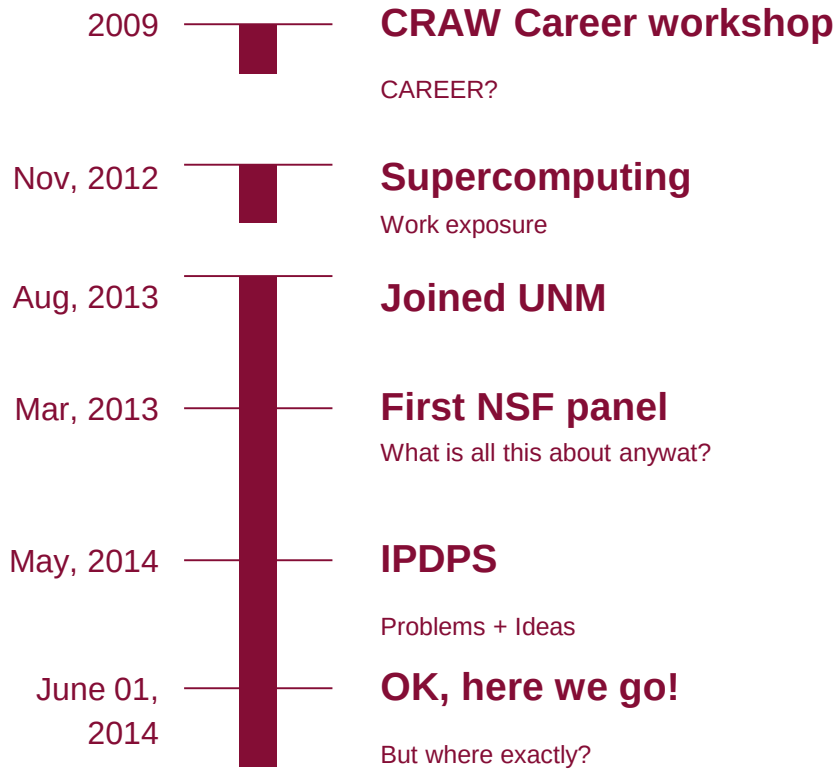
June 01, 2014 — **OK, here we go!**

But where exactly?

Ok, here we go!!

but where?





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

World Cup 2014

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Jun 12, 2014 — **World Cup**

Soccer + writing

FIFA WORLD CUP Brasil

World Cup 2014

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Focus and Motivation

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Soccer + writing

FIFA WORLD CUP
Brasil

- 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

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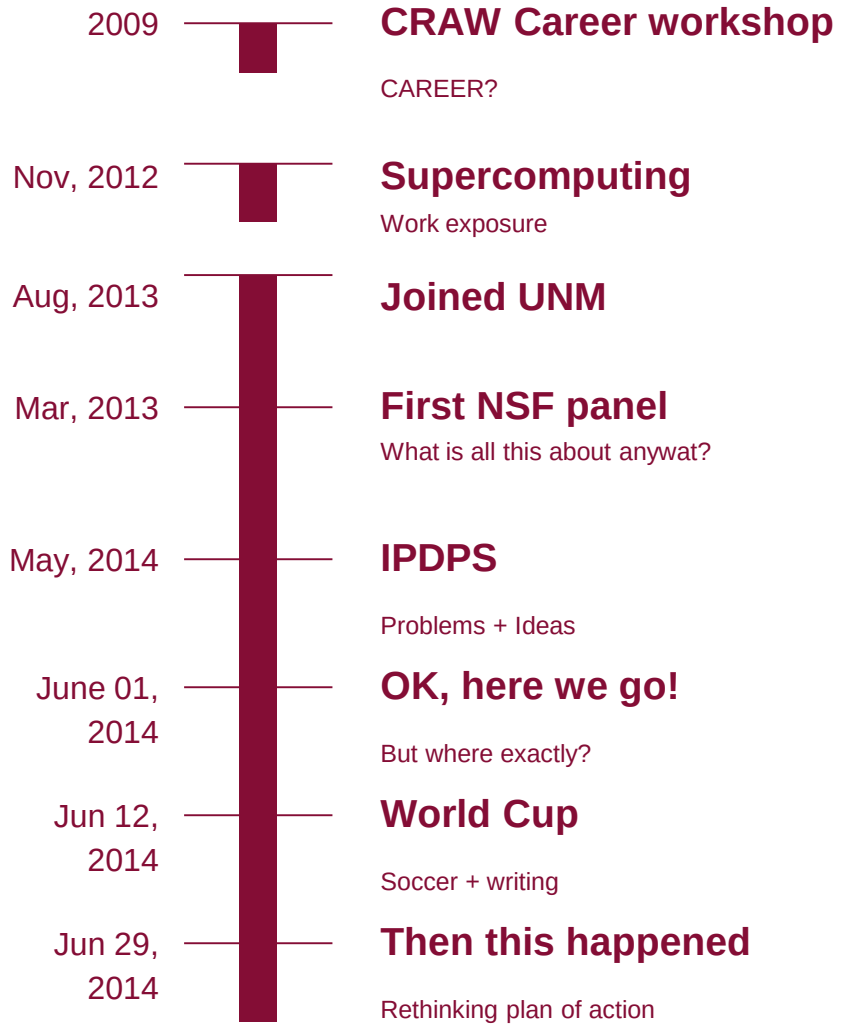
Jun 29, 2014 — **Then this happened**

Rethinking plan of action



Rethink the plan of action: better organization

For each contribution:

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

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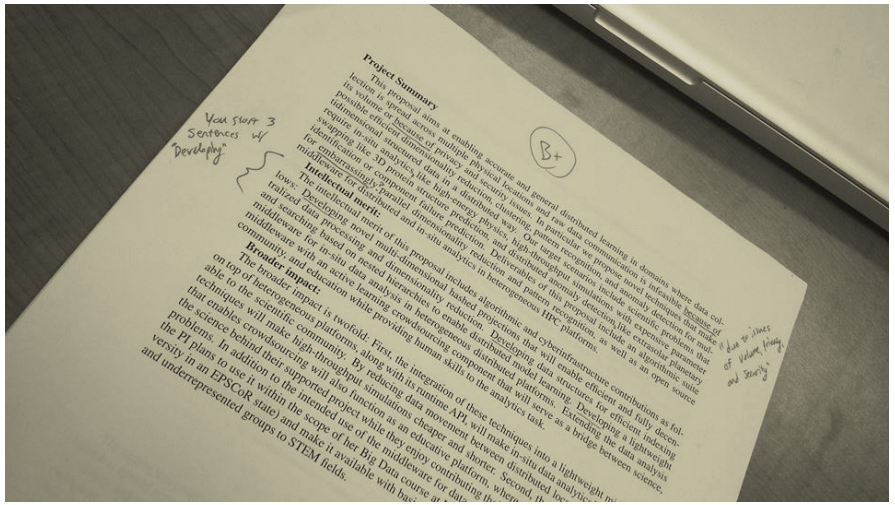
Rethinking plan of action

July,, 2014 — **First draft**

So proud, but got grilled

Get feedback from both, senior and junior colleagues

- Be more concrete
- Give a quantitative example
- Explain in plain terms why is this important



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May, 2014	**IPDPS** Problems + Ideas
June 01, 2014	**OK, here we go!** But where exactly?
June 12, 2014	**World Cup** Soccer + writing
June 29, 2014	**Then this happened** Rethinking plan of action
July, 2014	**First draft** So proud, but got grilled
A few hours before the deadline	**Final draft** Yayy!!

Final draft, submitted just hoping to get initial feedback

To contact or not to contact NSF Program Director?

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So proud, but got grilled

A few hours before the deadline — **Final draft**

Yayy!!

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

NSF Career Panel: Francisco Elohim Becerra

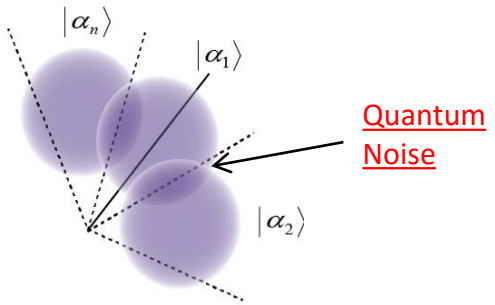
Quantum Measurements for Optical Communications

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

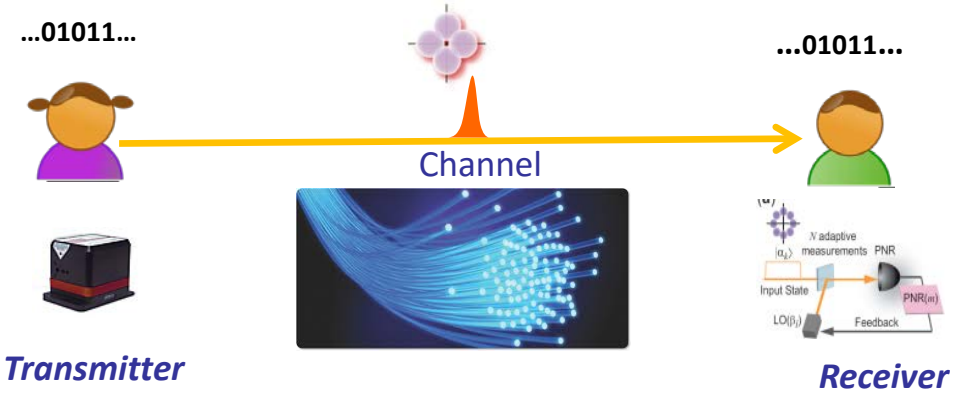
Light

- Photons from lasers

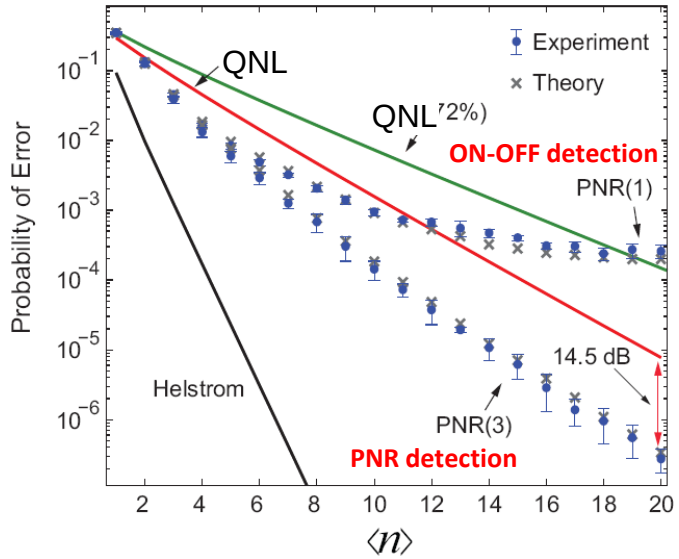
Coherent States: *Nonorthogonal*



Communications

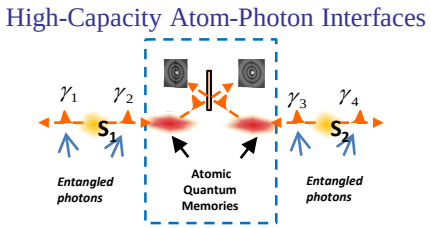


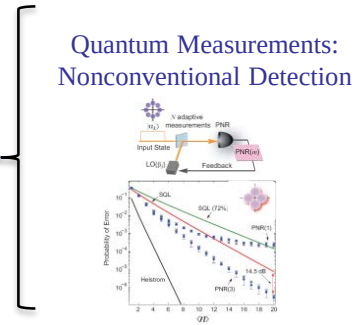
Discrimination
Unavoidable Errors



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

CAREER: prepare and submit

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 <u>want</u> 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

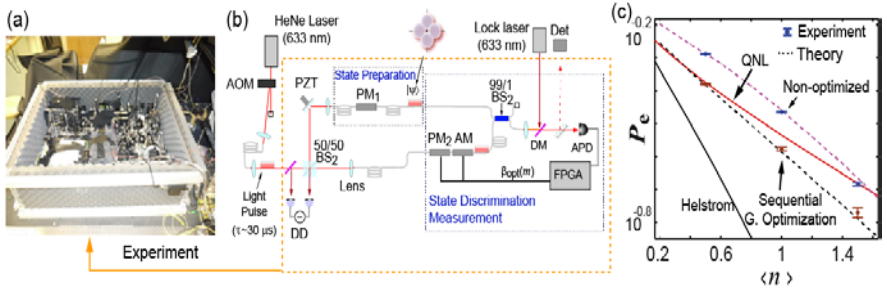
- **01-2017:** Call and message from NSF
  - CAREER recommend that it be supported at the level of $100,000/yr for 5 years
  - Re-budget and resubmit
  - Grant started **April 27, 2017**.

CAREER proposal: Science

Components

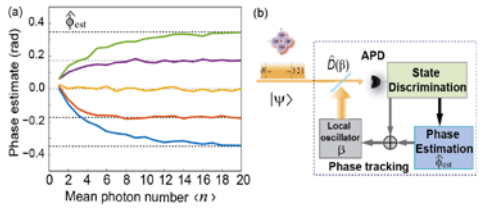
Current research

- *Prelim data*
- Prelim theory



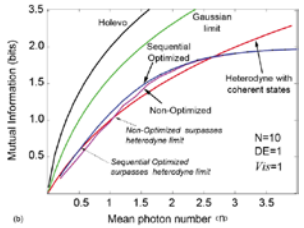
New research

- Some prelim theory
- solve current problems (optical and quantum comm.)



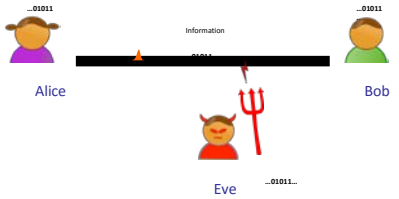
Newer/paradigm shifting research

- *Ideas of superadditivity*
- *Very difficult and futuristic*
- *Groundbreaking impact in communication and information theory*



Broader impacts (*Vision*)

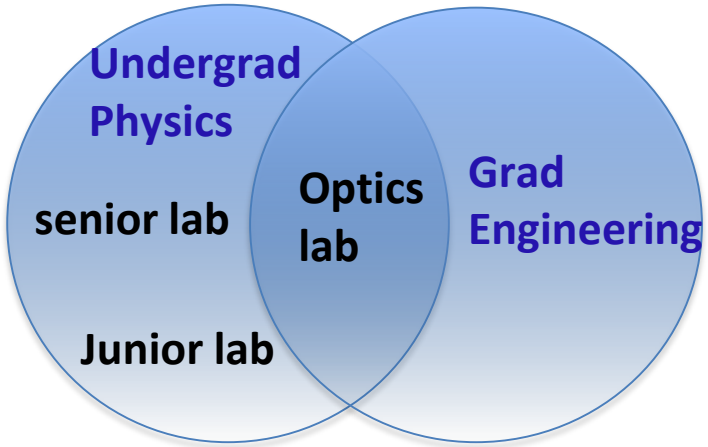
- *Impact in current technologies?*
- *How would change current fields?*
- *Which other fields would open?*



CAREER proposal: Education (4/15 pgs.)

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

Experiments
- **Atomic**
- **Optics**
- **Lasers**
- **Quantum mechanics/optics**



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**

- **Use experiments to integrate undergraduate in research**

Portable source of entangled photons (undergraduate research)
- Teaching labs
- Research in my lab

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*.)

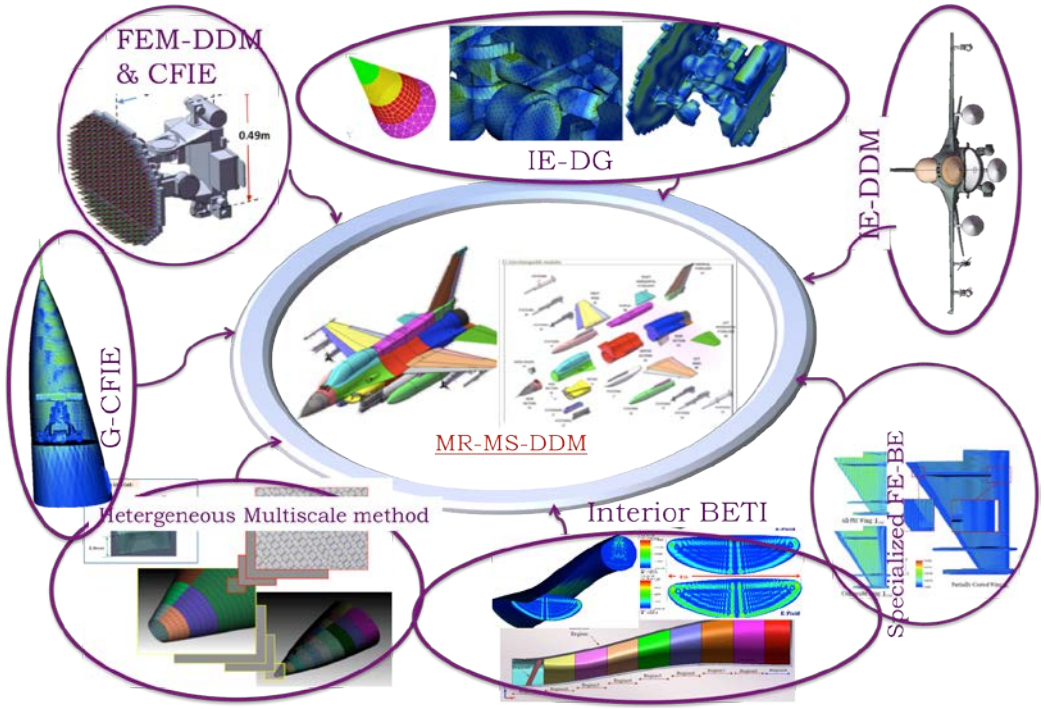
- 2017: ECCS - COMMS, CIRCUITS & SENS SYS

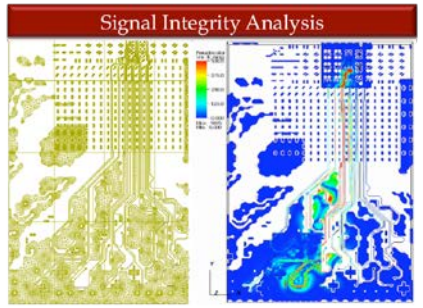
- Other award NSF project: 2015 CCF/AF, 2016 CCF/AF SUP

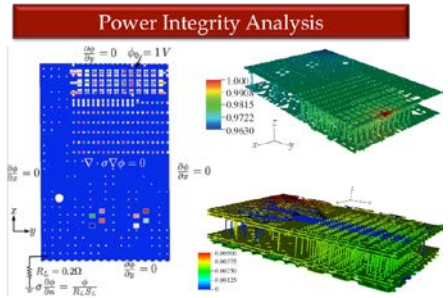
My research background

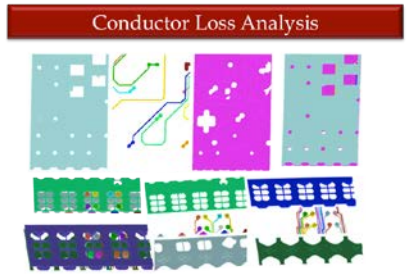
Computational and Applied Electromagnetics

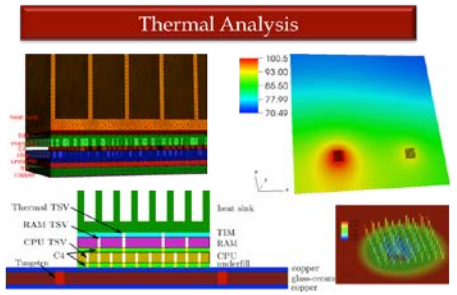
- Supercomputing-enabled design-through-analysis paradigm
- Scalable computational algorithms, domain decomposition methods
- Multi-physics and multi-disciplinary model and simulation
- Computational Electrodynamics with machine intelligence









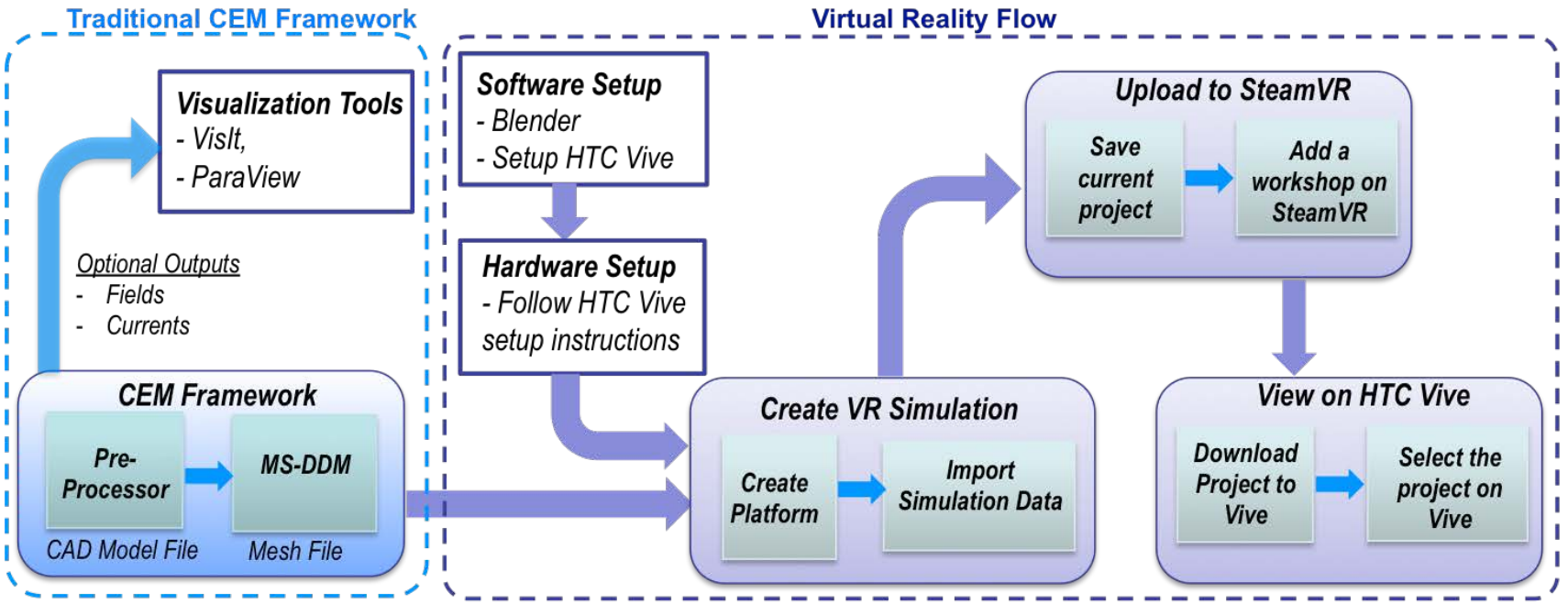


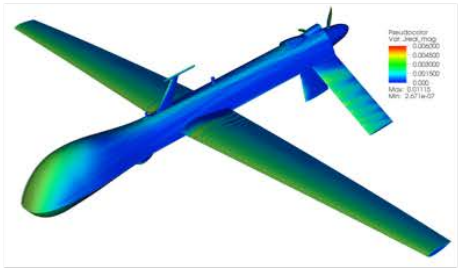
CHOOSE A GOOD AND SPECIFIC PROBLEM

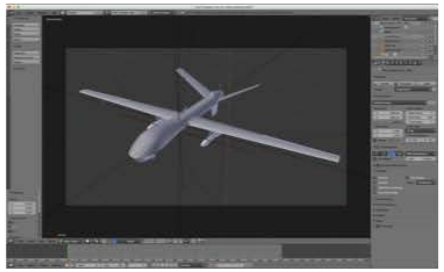
- New research directions, focused, and innovative
- Think about the 5-year and 10-year plan, and how does the proposed work support the long-term plan
- Develop the idea, why are you the person to investigate the problem
- My long-term career goal: use computer simulation to perform virtual experiments 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.

Education and Broad Impact

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.







Program director & NSF panel

- 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

Mentors and Department Letter

- 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

Society recognition

- 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!

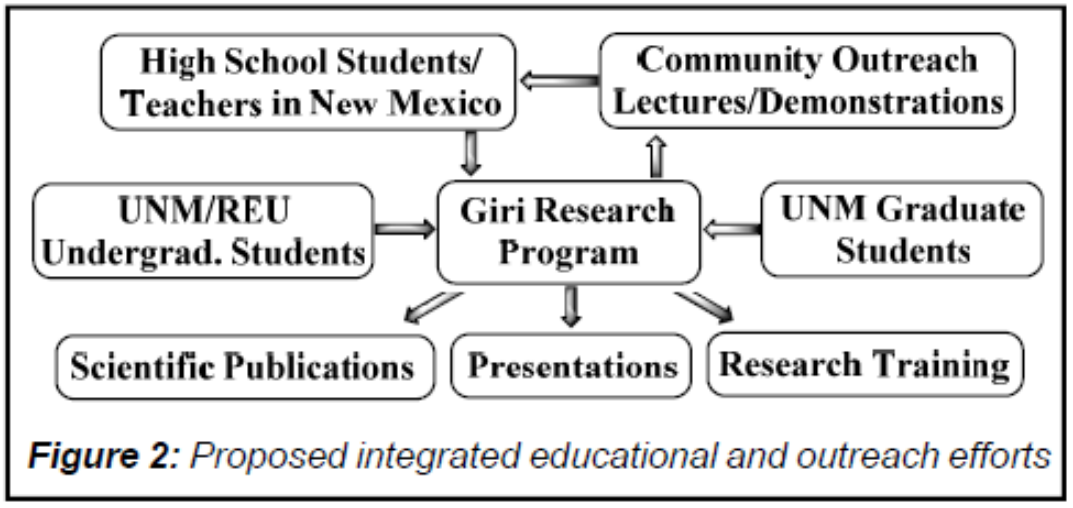


Figure 2: *Proposed integrated educational and outreach efforts*

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

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?

OR

My Fearless Friend Asked for $900K

When NSF Decided to Fund the Proposal:

20% Cut = 720K

Combiflash

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!

Ask as Much as You Need but Clearly Justify it!

Talk to Your Program Officer (Director)

Good Luck!

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

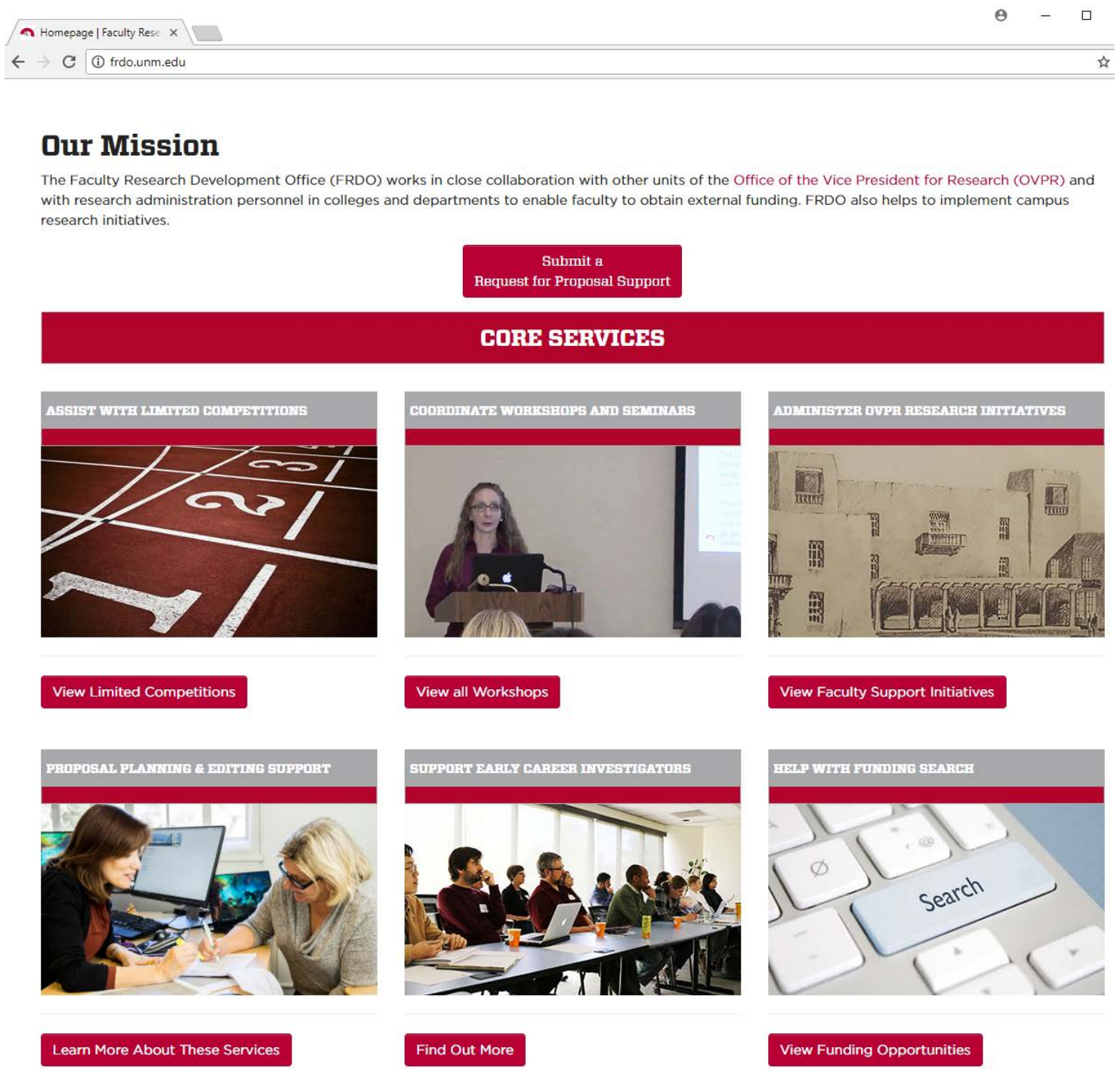
Career Awardee Panel Discussion

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

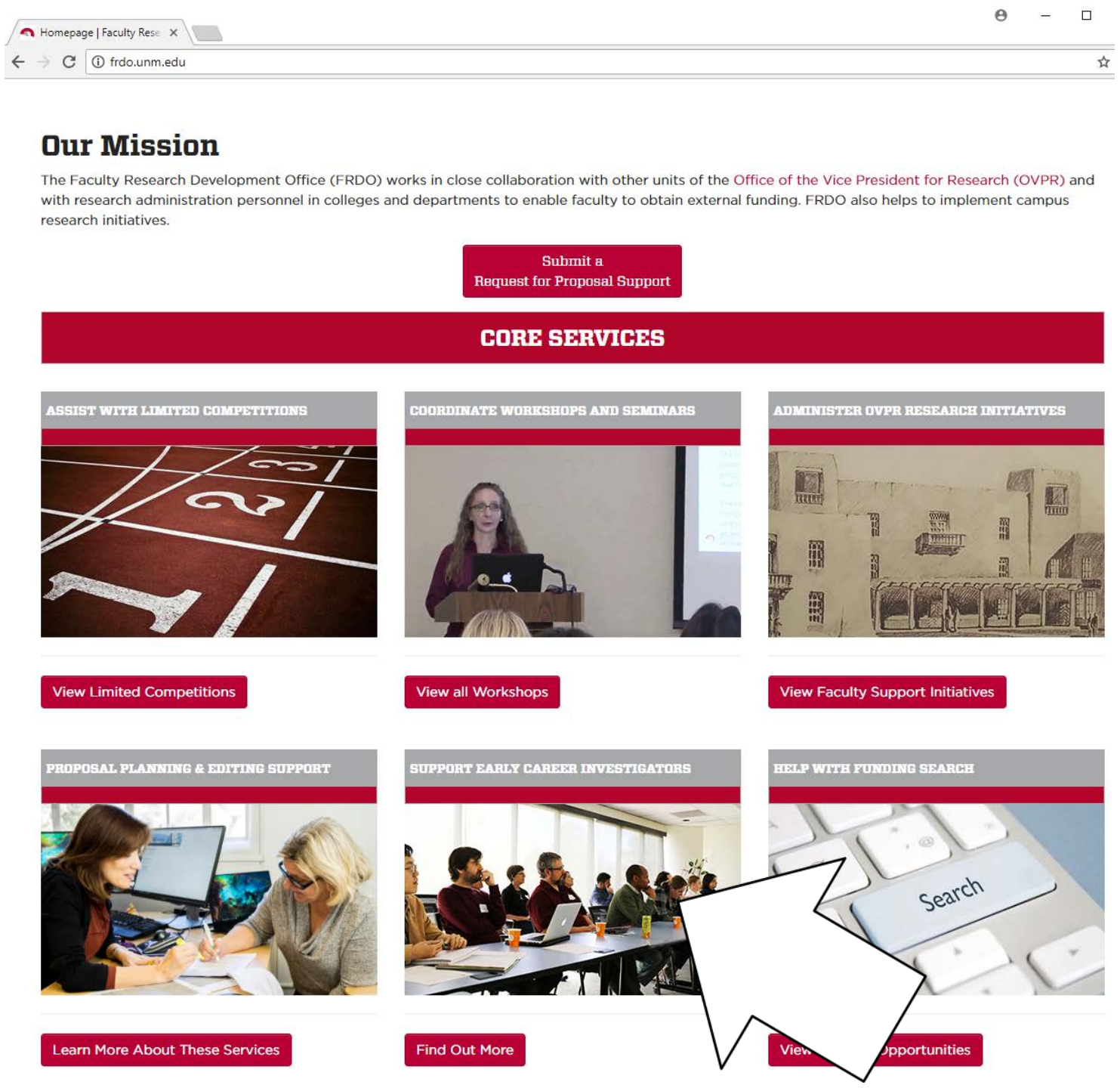
In Summary…

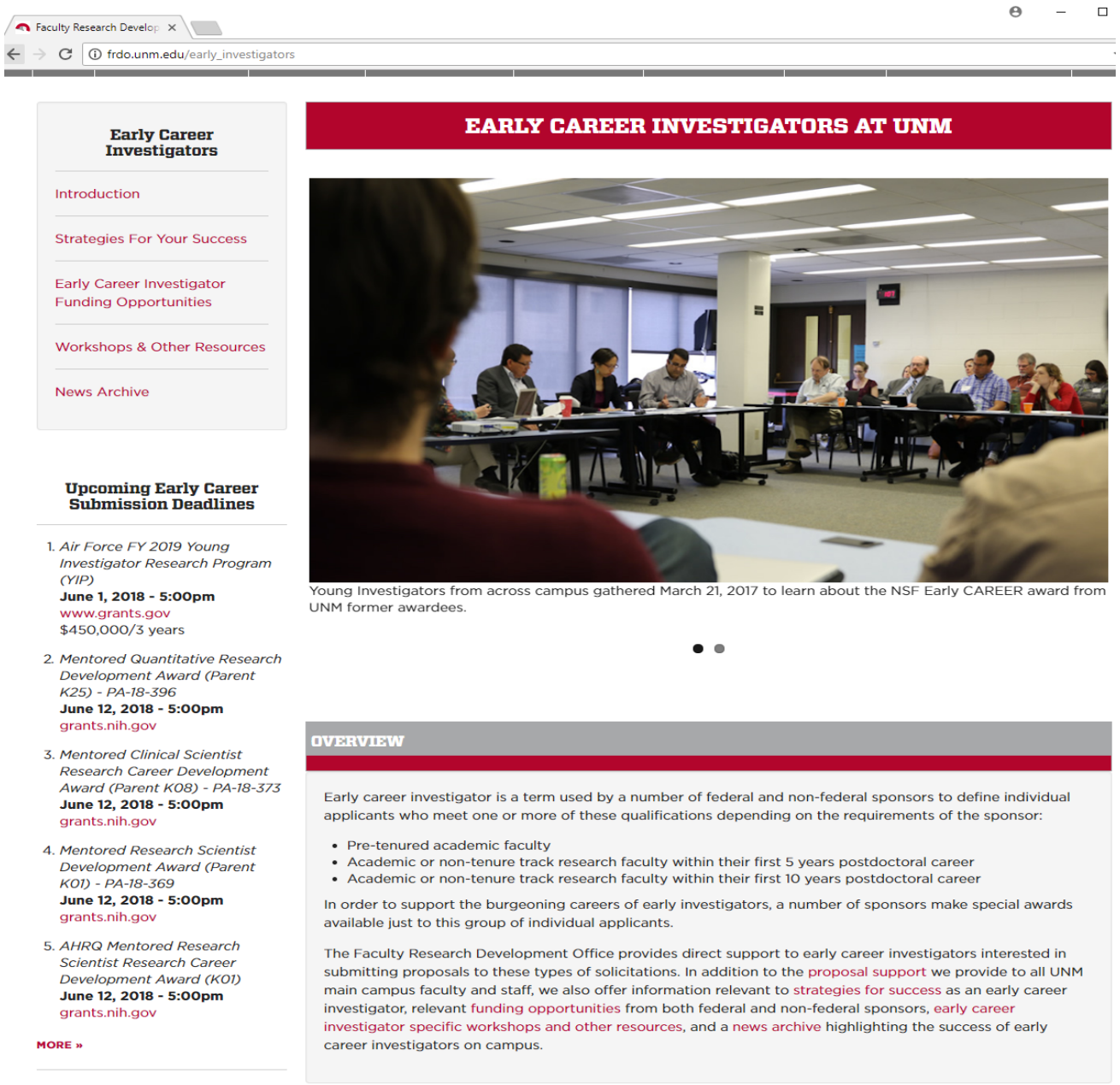
- Think Program not Project
  - 10-20 year plan with first 5 fully funded
- Clearly Integrate your **Research** *and* **Education**
  - Find out where your research fits within NSF, national, and global priorities
- Develop an Education Plan you want to and can do
- Assessment/Evaluation *is* important
- 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



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.

CAREER Proposal Timeline

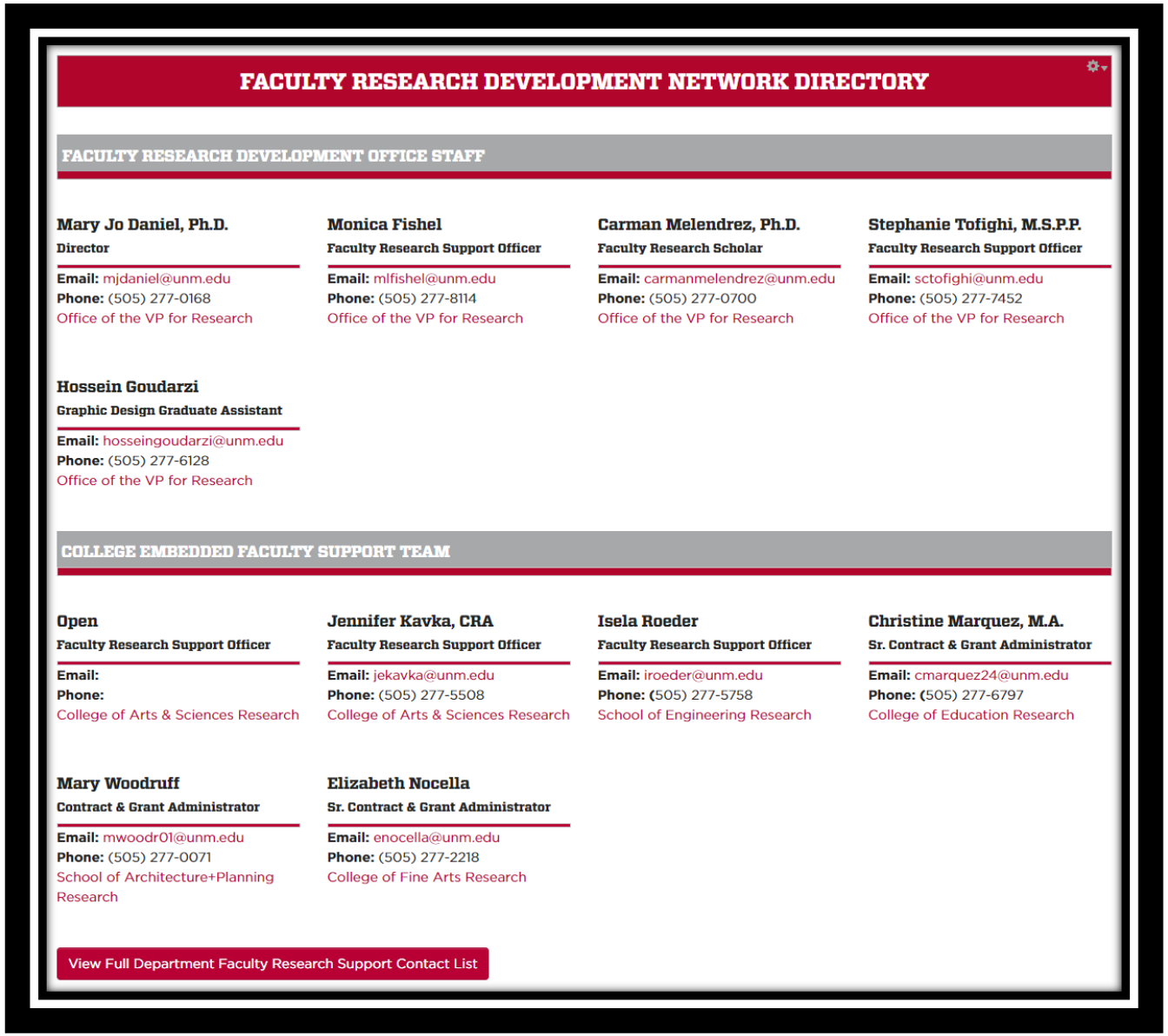
Time Frame	Task
D – 12 months	Start making outreach connections if part of your proposal
D – 6 months	Select expert readers to advise on proposal (Internal & External)
D – 2 months	• Talk to your chair about required resources you'll need to include in department letter • Share a rough draft with readers (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

Time Frame	Task
D – 12 months	Start
D – 6 months	Select
D – 2 months	• T • S • 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

D – 2 months	• Talk to your chair about required resources you'll need to include in department letter • Share a rough draft with readers (non-expert & expert) • Start working with department FRSO or administrator to develop proposal

Questions?



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