Applying for NSF CAREER Awards

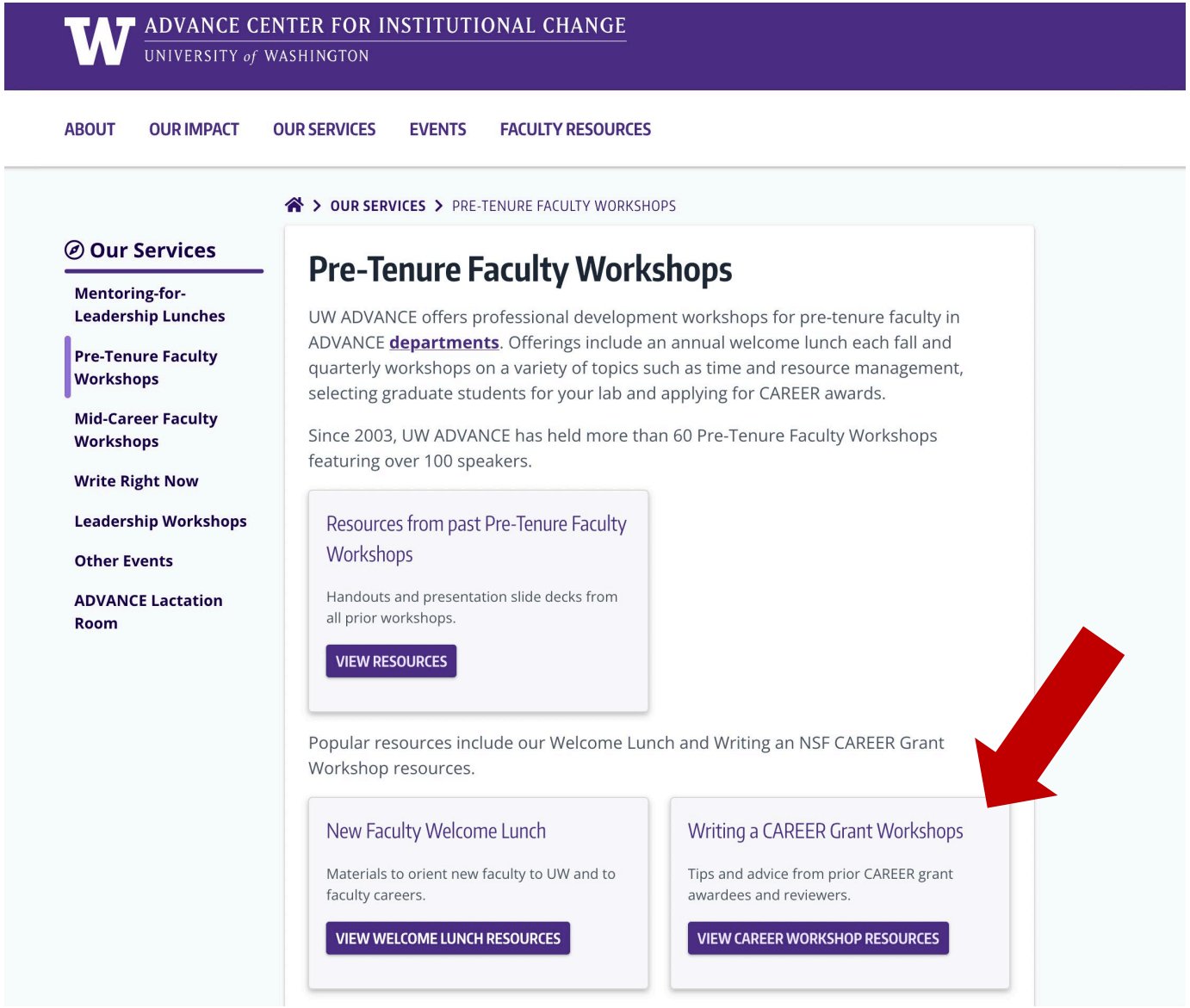
Spring Quarter Pre-Tenure Workshop

May 1, 2024

ADVANCE CENTER FOR INSTITUTIONAL CHANGE
UNIVERSITY of WASHINGTON

Prior CAREER workshop resources

https://advance.washington.edu/services/pretenure



CAREER Awardees and Panelists

- Linda Bushnell, Research Professor, Electrical & Computer Engineering
- Bhuvana Srinivasan, Associate Professor, Aeronautics & Astronautics
- Dianne Xiao, Assistant Professor, Chemistry
- Sajjad Moazeni, Assistant Professor, Electrical & Computer Engineering

Best Practices for Writing an NSF CAREER Proposal

Linda Bushnell

Research Professor, UW ECE, since 2000

Previously IPA at NSF/CISE/CNS for 4 years 3/2020 - 3/2024

Thinking of your Idea

- Talk with an NSF Program Officer before submitting a proposal. Send 1-pager with your ideas for your CAREER plan and ask for a meeting.
- Participate on panels. Contact NSF Program Officers to ask to be on panels.
- Learn about the programs at NSF. Read the solicitations. Make sure it fits the program solicitation.
- Submit a proposal to NSF before writing a CAREER proposal.
- Career plan vs 3-year project.
- Look at recent CAREER awards on NSF.gov; read the abstracts.

Writing the Document

- Get advice from colleagues. Ask others to read your draft proposal and give constructive feedback. Ask non-experts to read your draft for readability and big-picture ideas.
- Pick a nice problem. Pick one area and dive deep, with substance. Make sure it is not too abstract and not too narrow. Make it exciting and be ambitious; be bold, creative. Make your proposal stand out.
- Is it a great idea? Why should NSF fund it? Be realistic of what can be done. Show your **passion** on the topic area and the problem.
- Audience: Make sure your proposal can be understood and appreciated by researchers who are not specialists in your area.

The Heilmeier Catechism

- What are you trying to do? Articulate your objectives using absolutely no jargon.
- How is it done today, and what are the limits of current practice?
- What is new in your approach and why do you think it will be successful?
- Who cares? If you are successful, what difference will it make?
- What are the risks?
- How much will it cost?
- How long will it take?
- What are the mid-term and final “exams” to check for success.

George H. Heilmeier, a former DARPA director (1975-1977)

https://www.darpa.mil/work-with-us/heilmeier-catechism

Bhuvana Srinivasan

Associate Professor
Aeronautics & Astronautics

NSF proposal, my story

- My background:
  - Started as an Assistant Professor in 2014
  - Was unsure about whether CAREER proposals made sense for me initially
  - Program manager started sending NSF, including CAREER, proposals for ad hoc reviews
  - In 2018, a few weeks before the deadline, I decided to just do it
  - Never applied to NSF before this
  - Program manager spoke to me in November 2018, awarded early 2019
  - 5 ad hoc reviewers

- Reviewing regular NSF and CAREER proposals and serving on panels was helpful
  - Ask your program manager for opportunities to review proposals

NSF review criteria, note CAREER's goal is to launch the rest of your faculty career

Evaluate strengths and weaknesses for the following:

- Potential to advance knowledge (Intellectual Merit)
  - ***CAREER: Clear research objectives, research is transformative***
- Potential to benefit society (Broader Impacts)
  - ***CAREER: Clear benefit to society beyond immediate field, broadening participation, workforce development***
- Extent of creative, original, or potentially transformative concepts?
- Well-reasoned, well-organized, based on sound rationale? Mechanism to assess success?
  - ***CAREER: Integrated research and education plan metrics for success, assessment***
- Qualifications, Resources – long-term thinking

Reviewer rating: E/V/G/F/P – want majority E/V to get funded

For example, mine: E/E/E/V/V

How is CAREER different from regular NSF awards? The goal of CAREER is to launch your faculty career

- Clear integration of research and education is key to establish leadership and a long-term career as a faculty member, ***research alone is not sufficient but is most important***
  - Metrics for success of research outcomes
  - Metrics for success of educational outcomes
- What discouraged me initially – level of creativity needed to integrate research and education. *How much creativity is needed beyond what others have proposed*? Daunting?
  - Yes, ***creativity and originality*** is important in all aspects of the proposed work
  - Keep in mind the goal of CAREER is to ***establish leadership in research and education*** (your job as a faculty member!)
  - What is most important is that everything is ***well-integrated, concrete, and specific***
  - I ***leveraged*** outreach and educational programs that already existed at my previous institution and integrated them into my CAREER plan

Dianne Xiao

Assistant Professor, Chemistry

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Research plan: General grant writing tips and phrases

1. **Significance:** What problem / knowledge gap is your proposal addressing, and why should we care?

- *The promise of X cannot be fully realized without Y*
- *A key barrier to the implementation of X is Y*
- *There is a huge unmet demand for X*
- *To date, no existing measurement / material / etc. has been able to do X*

2. **Innovation:** How is your proposal different from what's been done before?

- *Prior work has centered on X. Our distinctive / orthogonal approach focuses instead on Y*
- *Our interdisciplinary approach draws from both X and Y fields*
- *Our method provides unique capabilities, including X, Y, and Z*

3. **Overview figure:** Summarizes your entire proposal & specific aims

Ideally, all this information is succinctly summarized on the first page!

Educational plan

- **Get students involved!**
  - The strongest part of my educational plan (clean energy outreach targeting the older adult population / senior centers) was 100% my graduate student's idea.

- **Take advantage of existing resources but make sure you put your own spin on them.**
  - The UW Clean Energy Institute (CEI) is a great resource. They are always excited to support new outreach ideas led by students/faculty.

- **Be careful about proposing activities that tie in too closely with your undergraduate teaching responsibilities.**
  - In addition to K–8 and older adult outreach, I also proposed a significant revision of lab curriculum. Feedback on that was mixed and the reviewers were more excited about my other proposed educational activities.

Other general advice

- Ask colleagues for examples of successful CAREER applications
  - Ask for **WHOLE** application package, not just the proposal!
  - NSF has very specific formatting guidelines, and it can be very helpful to see prior examples. (A heartbreaking anecdote – a friend got her proposal sent back without review because her references didn't have titles!)

- NSF Early Career Workshop – would highly recommend (at least for chemistry). Great way to meet and network with peers in your field

- If you have questions about which program to apply to, what is a reasonable budget, etc. – ask your program manager!

- Search through past awards (filter by your program, and keyword "CAREER"): https://www.nsf.gov/awardsearch/advancedSearch.jsp

NSF CAREER Grant Writing Tips

Sajjad Moazeni
Assistant Professor of ECE
University of Washington, Seattle

May 1, 2024

My Story …

- Started in Sept. 2020 -> Applied in July 2021-> Received an email from PM in Jan 2022 -> March 2022 Official award ☺
  - I had received an NSF EAGER grant before I start in Sept. 2020

Questions I faced with …

1. Q: I have multiple ideas (all based on previous work), which topic to choose?
2. Q: Which program to apply? ECCS, EPMD, …
3. Q: Do I need initial results/publications on the proposed project?
4. Q: What is the proper budget for this?

1. A: Pick the one you have a stronger publication track record in
2. A: Whichever more related to your topic, but maybe this might influence your proposal direction.
3. A: No!
4. A: Used to be $500k, now more like no cap! (But mostly ~$750k)

NSF CAREER Grant Writing Advice

- When should I apply to this? (I have limited shots :/)
  - I suggest going through one full NSF proposal submission and review once before applying to the CAREER program.
  - You do not need any preliminary published results

- Educational Part of CAREER Proposal:
  - Dedicate ~2 pages for this.
  - Be as original as you can (rather than general statements and plans)
  - Include outreach and DEI plans

NSF Grant Writing Tips …

- Executive summary approach for the first 2-pages.
  - Break the work into 3 thrusts and 2 task per thrust, this template format helps a a lot in shaping your thinking as well
- Figures matter a lot (more than text!) Spend time on those, and make them easy to understand
- Adding “essential” sections helps even though they might have redundant information!
  - Example: having ”Evaluation Plan” for each of proposed thrusts
- Some sort of easy graph, table, etc. to compare proposed method with previous work helps
- Be respectful to other related topics, work. Those researchers and authors can be on the panel to review your work
- Ask colleagues to read and give you feedback:
  - They should have been on the NSF panels before and preferably ask colleagues who are not too close to your area (helps with unbiased feedback)

More Resources

Some UW Broadening Participation Contacts

- OMAD College Access programs:
  - https://www.washington.edu/omad/pre-college-recruitment/
- OMAD student services programs:
  - https://www.washington.edu/omad/services-for-uw-students/
- CoEnvr DEI programs:
  - https://environment.uw.edu/about/diversity-equity-inclusion/
- Arts and Sciences DEI resources:
  - https://artsci.washington.edu/about/diversity-equity-inclusion
- CoE DEI resources:
  - https://www.engr.washington.edu/about/diversity

Document Outline

- Title: Think about a good, short title that is representative of the work.
- Project Summary: 1-page summary. Write this so that any non-expert can understand what you are doing.
- Introduction:
  - State clearly your **vision** in 1 sentence. Broad area of research that you plan to work in for many years. Highlight this on page 1 of the proposal.
  - What is the problem that you are trying to solve? Give motivation for the problem. Why is your work significant? Impactful?
- Research Thrusts:
  - 1-2 RQs for each thrust , technical detail, nice figures.
  - Current state-of-the-art, research gaps, prior work, literature references.
- Experimentation/validation: Define metrics that let you evaluate your proposed methods. How do you know you are successful? Make this section substantial with nice figures.
- Facilities Document: use this to add more about your testbed; include figures and details of the platforms.
- Integrating Research and Education: Write the education plan in the context of your career. For example, why are the proposed courses/activities necessary for your career path? Be creative and give this some real thought. What educational/outreach activities do you want to continue for 5+ years?
- Broader Impacts: How does your work impact society? Broader impact should go beyond dissemination of your work. This should be substantial for the CAREER plan.
- Budget: ask the Program Officer; usually 1 month and 1 student.

Reminder:
CAREER "Speed Dating" Abstract Review and Writing
June 18th Time & Location TBD
Call for RSVPs forthcoming

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Questions?