



ENG CAREER Proposal Writing Workshop: Perspectives on the CAREER Proposal



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April 1-2, 2019

Workshop Agenda

Day 1:

- Opening Plenary
- Mock Panels
- Lunch
- Discussion panel with CAREER program awardees
- Breakout 1: Lessons learned from mock panel review process
- Breakout 2: Writing an effective project summary

Day 2

- Breakout 3: Starting the project description off right
- Breakout 4: Developing a strong research plan
- Breakout 5: CAREER proposal strategies and career plan
- Discussion panels with ENG program officers by Division
- Lunch
- Coaching sessions with ENG program officers by sign-up





Plenary Outline

- What is the CAREER program?
 - Your Strategic Plan for your career
- Finding a program home
 - Identifying a Research Topic & Objective
- Review criteria & process
- Summary





CAREER Program: Objectives

- “A Foundation-wide activity that offers the National Science Foundation’s most prestigious awards in support of early-career faculty who have the potential to serve as **academic role models in research and education and to lead advances in the mission of their department or organization.**”
- “Activities pursued by early-career faculty should **build a firm foundation for a lifetime of leadership in integrating education and research.**”





CAREER Program

- Read the solicitation **NSF 17-537** and FAQs **NSF 17-050**
- Due date: ENG July 18, 2019 (Third Thursday)
- Project duration: 5 years
- Your proposal must be compliant with all requirements of the current NSF Proposal and Award Policies & Procedures Guide ([PAPPG 19-1](#), February 25, 2019)
- Upcoming NSF CAREER Webinar 2019: May 9, 2019, 2-4 pm
- CBET Webinar: May 15 details coming

https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503214



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Faculty Early Career Development Program (CAREER) Includes the description of NSF Presidential Early Career Awards for Scientists and Engineers (PECASE)

Available Formats: HTML | PDF
Document Type: Program Announcements & Information View Program Page
Document Number: nsf17537



CAREER Project Budgets for ENG

- Read the solicitation **NSF 17-537** and FAQs **NSF 17-050**
- CAREER budget requests should reflect the scope of the research and education plans, and the practices within your discipline
- For ENG, the minimum CAREER award size is expected to be \$500,000, including indirect cost or overhead, **for a 5- year period**
- Final budgets are negotiable if selected for award
- Consider sufficient financial support for you as a PI and for a graduate student





CAREER: Considerations for Collaborators

- No Co-PIs allowed
- Senior personnel and collaborators are permitted including for evaluation and assessment
- Senior personnel can be in the project budget; their role should be limited
- Budget for evaluation can be included
- Collaborative arrangements of significance should be documented through letters of collaboration and should follow PAPPG guidelines





CAREER: Department Chair Letter

- A letter from a department chair or equivalent organizational official is required; refer to requirements in the CAREER solicitation
- An indication that the PI's CAREER activities are supported by and integrated into the goals of the Dept. and organization and the Dept. is committed to the support, mentoring and professional development of the PI
- A description of the relationship between the CAREER project, the PI's career goals and job responsibilities, and the goals of his/her department/organization
- Verification of the PI's self-certified CAREER eligibility





Your Strategic Plan

- A strategic plan has three parts:
 - Where are you today?
 - Where do you want to be in the future (5, 10, 20 years from now)?
 - How do you get from here to there?
- Questions: What do you want to leave as your career legacy?
Do you need to work on important problems?





A strategic plan should...

- Build on your strengths
- Differentiate this proposal from your Ph.D. thesis work and other sponsored work
- Distinguish your research project from others in the field





Your Proposal

- Should advance you along your strategic plan
 - Should be a stepping stone to the next thing
- Should be compatible with your institution's goals
- Should represent a contribution to society at large





Be aware ...

*The CAREER award is not
a research award.*

*The CAREER award is a career
development award.*

*Your proposal must
reflect this focus.*





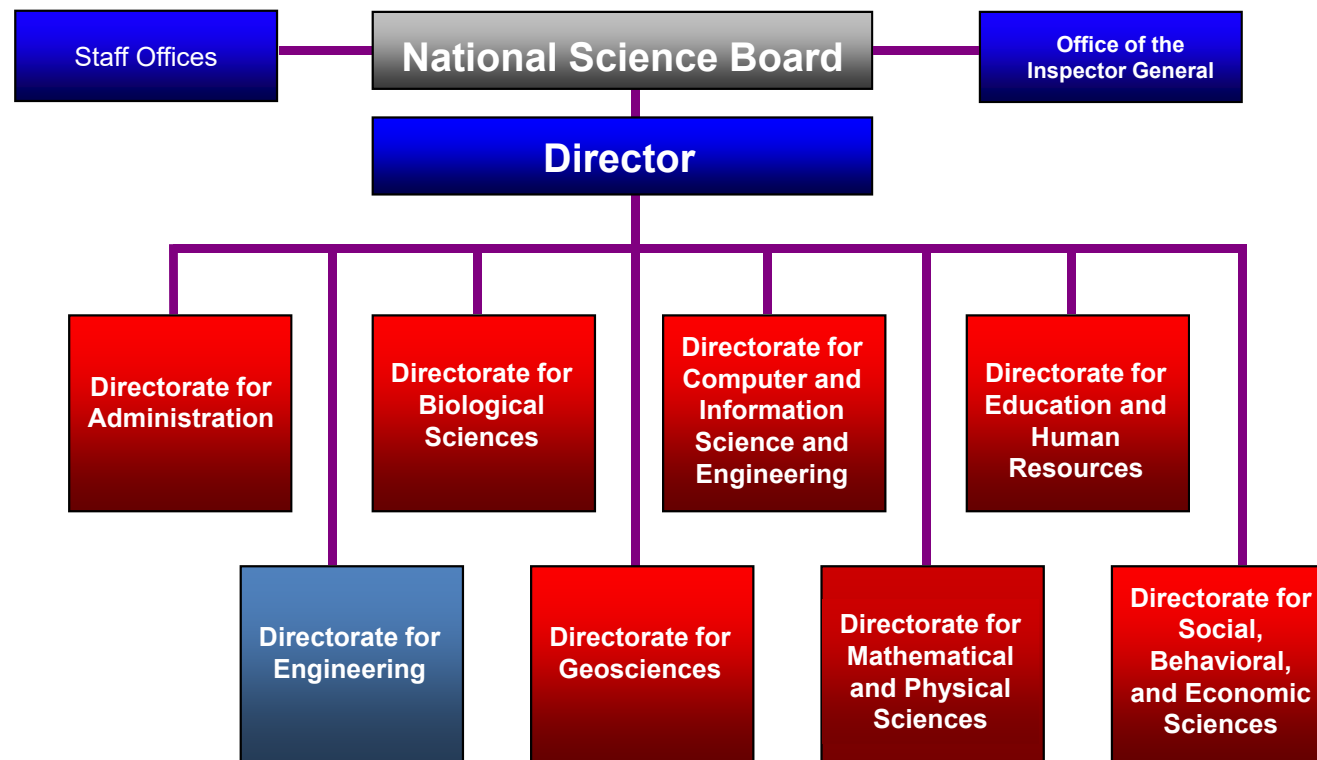
Finding a research home

- Are you proposing scientific research?
- No?
 - Look for support from other sources
- Yes?
 - Your research objective determines the NSF program fit, not the application of your research results.
- Be prepared to answer the question: “What is your research objective?” in 25 words or less



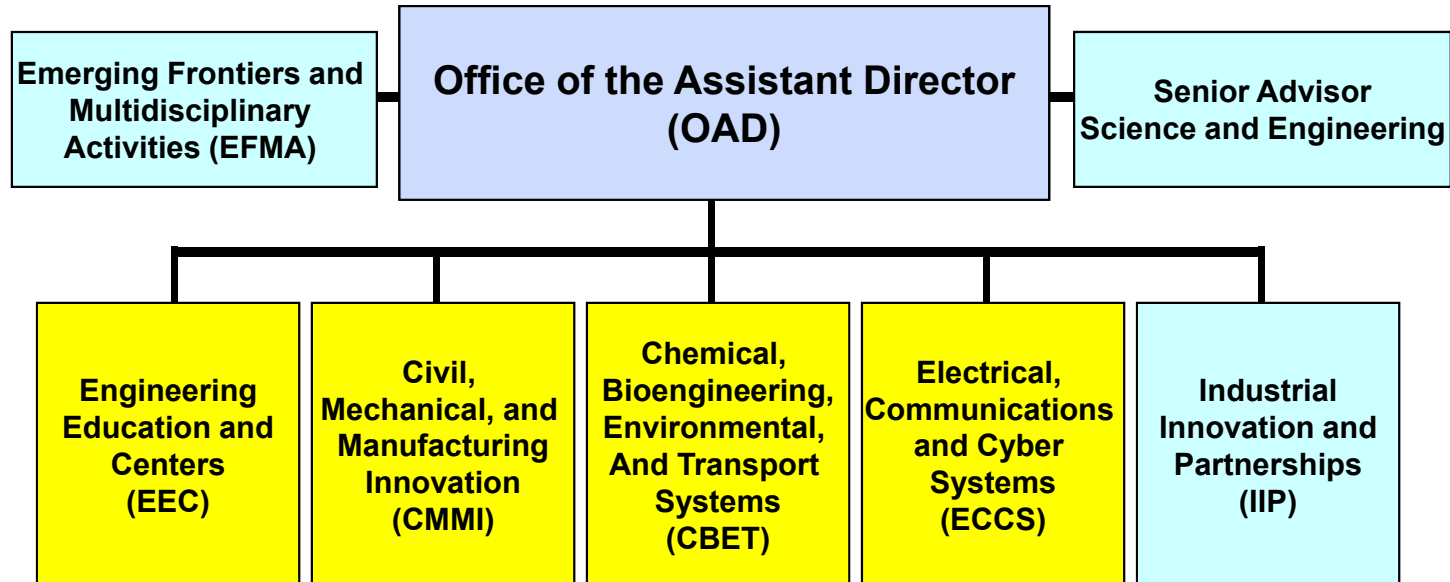


NSF is Organized Around Research Topics





ENG Organization





The Next Step: You submit to a program

- Look at NSF's web site: www.nsf.gov
 - Check out research programs
 - Read what research topics they support
 - Abstracts for recent awards
 - Workshop reports





Award Search Capabilities

NSF Award Search: Advanced Search - Internet Explorer

https://www.nsf.gov/awards

File Edit View Favorites Tools Help

Play Daily Crossword - Th... Log In - NSF Wiki Home - Executive Develo... IPA Performance Manage... Microsoft Forefront TMG Employee Express - Home... Suggested Sites

Awards Advanced Search

[Overview of Award Search Features](#)

Awardee Information

Principal Investigator First Name

Principal Investigator Last Name

☐ Include Co-Principal Investigator in name search

Organization

State

Zip Code

Country

Program Information

NSF Organization

Element Code

Reference Code

Any All

Any All

HINT: The "Program" box searches both program element and program reference names and codes.

Program

Program Officer

Additional Information

Keyword

HINT: The Keyword field searches on the title and abstract only.

☐ Search Award Title Only

Award Number

Award Amount

Award Instrument

HINT: Data prior to 1976 may be less complete.

☒ Active Awards ☐ Expired Awards

Original Award Date

Start Date

End Date

From To

From To

From To


Search Reset





Award Data


Awards



- [Search Awards](#)
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How to Manage Your Award

- [Grant Policy Manual](#)
- [Grant General Conditions](#)
- [Cooperative Agreement Conditions](#)
- [Special Conditions](#)
- [Federal Demonstration Partnership](#)
- [Policy Office Website](#)



Award Abstract #1553815

CAREER: Surface Texturing of Bulk Metallic Glasses for Fabrication of Complex Micro Optics

NSF Org:	CMMI Div Of Civil, Mechanical, & Manufact Inn
Initial Amendment Date:	January 4, 2016
Latest Amendment Date:	January 4, 2016
Award Number:	1553815
Award Instrument:	Standard Grant
Program Manager:	Steven R. Schmid CMMI Div Of Civil, Mechanical, & Manufact Inn ENG Directorate For Engineering
Start Date:	April 1, 2016
End Date:	March 31, 2021 (Estimated)
Awarded Amount to Date:	\$500,000.00
Investigator(s):	Xiaoliang Jin xiaoliang.jin@okstate.edu (Principal Investigator)
Sponsor:	Oklahoma State University 101 WHITEHURST HALL Stillwater, OK 74078-1011 (405)744-9995
NSF Program(s):	CAREER; FACULTY EARLY CAR DEV, Manufacturing Machines & Equip, EXP PROG TO STIM COMP RES
Program Reference Code(s):	082E, 083E, 1045, 1468, 9150
Program Element Code(s):	1045, 1468, 9150

ABSTRACT





Award Abstracts

ABSTRACT

This Faculty Early Career Development (CAREER) grant will provide fundamental understanding of a novel technique to fabricate complex micro optics through generating surface textures on bulk metallic glasses. Micro optics with surface textures play a significant role in broad applications, such as automotive illumination systems, high-resolution display panels, diffraction gratings for laser systems, and reflective mirrors for traffic safety. Bulk metallic glasses have been increasingly used in fabricating micro optics due to high hardness, high corrosion resistance and no surface defects. However, micro optics produced with existing techniques using bulk metallic glasses usually have high fabrication cost, limited geometric accuracy and surface quality due to thermal deformations of the material. This Faculty Early Career Development (CAREER) award supports fundamental research of a novel technique to fabricate complex micro optics through generating surface textures on bulk metallic glasses by diamond machining with applied vibrations. The new technique will significantly reduce production cost, and improve component quality (both geometric accuracy and surface roughness). The award also supports activities to integrate research results into education, expose the public to precision manufacturing and optics engineering, and prepare next-generation engineers in advanced manufacturing areas.

In the new technique, the planar vibration of the workpiece causes intermittent tool-workpiece contact, resulting in high-frequency variations of temperature and stress in material removal region. The first research





We encourage you to contact Program Directors

- Email the appropriate program officer(s) and ask if your research project fits their program
 - One page summary (max)
- Your program director can:
 - Confirm program fit
 - Give advice on common proposal preparation errors
 - Help you understand the review of a previous proposal
 - Point you to resources you can use to help write a better proposal next time
 - Give general guidance on good proposal writing





Questions You Shouldn't Ask a Program Director

- Will you fund my research?
- Is NSF interested in my topic?
- What hypothesis should I use?
- What research topic do you think I should work on?
- What is your program's funding rate?
- If I send a copy of my proposal to you, will you help me edit it?
- This is my last chance, what can I do?





CAREER Proposal Review Considerations

- The **Intellectual Merit** is the potential that your research has to advance the knowledge base of the field of science or engineering.
- The **Broader Impacts** focus on the potential benefit to society and achievement of desired societal outcomes.
- The **Integration of Research and Education** describes the reciprocal relationship between the proposed research and education activities and how they may inform each other in their career development as both outstanding researchers and educators.





Intellectual Merit

- The Intellectual Merit is the potential that your research has to advance the knowledge base of the field of science or engineering
- Questions:
 - What is already known?
 - What is new?
 - What will your research add?
 - What will this do to enhance or enable research in your or other fields?
- Why is your research important for the advancement of your field?





Broader Impacts

- The Broader Impacts focuses on the potential benefits of the research and the educational outcomes to society and achievement of desired societal outcomes
- Means to benefit society include:
 - Economic/environment/energy
 - Education and training
 - Providing opportunities for underrepresented groups
 - Improving research and education infrastructure

The key issue is how your research results will be applied — why would the general public care?





Five Key Review Elements for both IM/BI

1. What is the potential for the proposed activity to:
 - **advance knowledge** and understanding within its own field or across different fields (Intellectual Merit); and
 - **benefit society** or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore **creative, original, or potentially transformative** concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a **sound rationale**? Does the plan incorporate a mechanism to **assess success**?
4. How well **qualified** is the individual, team, or institution to conduct the proposed activities?
5. Are there adequate **resources** available to the PI (either at the home institution or through collaborations) to carry out the proposed activities?





Integration of Education and Research

- All CAREER proposals must have an integrated research and education plan at their core
- No single approach: NSF encourages all applicants to think creatively about how their research will impact their education goals and, conversely, how their education activities will feed back into their research
- Provide well-argued and specific activities that will, over a 5-year period, build a firm foundation for a lifetime of contributions to research and education





Assessment and Evaluation

- PIs are strongly encouraged to describe how the impact of the educational activities will be assessed or evaluated
 - Helpful document: NSF publication 02-057, *The 2002 User Friendly Handbook for Project Evaluation*





CAREER Proposal Review Process

- ENG has dedicated CAREER review panels
- Typically 4 reviews submitted before the panel
 - All reviews and Panel Summary will be released to PI
- Panelists are senior academic researchers with broad expertise
- No quotas for # awards for a given program
- No threshold in terms of mean rating





Take home: Proposal Basics

- Write to the reviewers (not to PD and not to yourself)
- Your proposal will be judged by the reviewers
- Reviewers need to know just a few things:
 - What is it about (the research objective)?
 - How will you do it (the technical approach)?
 - Can you do it (you and your facilities)?
 - Is it worth doing (intellectual merit and broader impacts)?
 - Will the effort provide a firm foundation for your career plans (integration of education and research)?
- This is, basically, all the proposal needs to convey – but it needs to convey this





Important Concept

**The reviewers read your
proposal, not your mind**

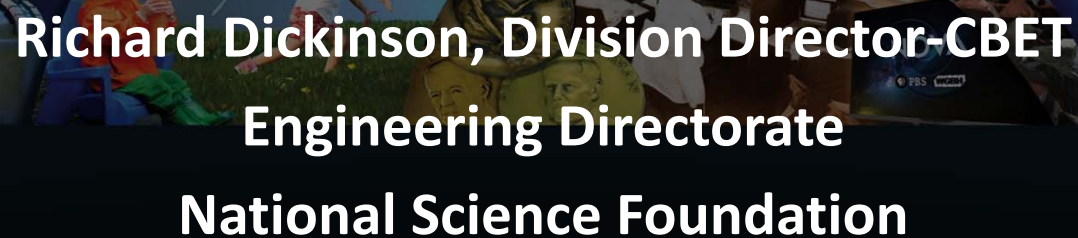




Volunteer to Be a Reviewer

- Proposal review is an important service to your community
- There's no better way to see how the system works
- There's no better way to understand what makes a proposal compelling





Richard Dickinson, Division Director-CBET
Engineering Directorate
National Science Foundation



National Science Foundation

MISSION OF CBET DIVISION

Support fundamental engineering research that involves:

- the transformation of matter by chemical, thermal, or biological means
- the transport of mass, energy, or momentum

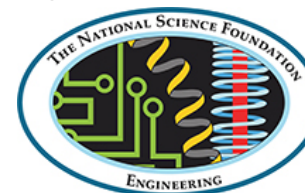
..in order to:

- maximize quality and length of life
- allows humans to live sustainably on earth





Division of Chemical, Bioengineering, Environmental, and Transport Systems



Chemical Process Systems

	1401 Catalysis Robert McCabe
	1417 Molecular Separations Christina Payne
	1403 Process Systems, Reaction Engineering, & Molecular Thermodynamics Triantafillos Mountziaris
	7644 Electrochemical Systems Carole Read
Chemical Process Systems Cluster VACANT	

Engineering Biology & Health

	1491 Cellular & Biochemical Engineering Steven Peretti
	5345 Engineering of Biomedical Systems Aleksandr Simonian
	7236 Biophotonics Leon Esterowitz
	7909 Biosensing Chenzhong Li
	5342 Disability & Rehabilitation Engineering Aleksandr Simonian
	Engineering Biology & Health Cluster Steven Zehnder (Acting)

Environmental Engineering & Sustainability

	1440 Environmental Engineering Karl Rockne
	1179 Biological & Environmental Interactions of Nanoscale Materials Nora Savage
	7643 Environmental Sustainability Bruce Hamilton
	022Y INFEWS James Jones
	Environmental Engineering & Sustainability Cluster Brandi Schottel

Transport Phenomena

	1407 Combustion & Fire Systems Harsha Chelliah
	1443 Fluid Dynamics Ronald Joslin
	1415 Particulate & Multiphase Processes William Olbricht
	1406 Thermal Transport Processes José Lage
	Transport Phenomena Cluster Shahab Shojaei-Zadeh

Division Experts and AAAS Science & Technology Policy Fellows

	Engineering of Biomedical Systems Expert Carol Lucas		Multiple Programs Expert Geoffrey Prentice		AAAS S&T Policy Fellow Shanni Silberberg		AAAS S&T Policy Fellow Thomas Baird
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National Science Foundation

SUPPORTED COMMUNITIES

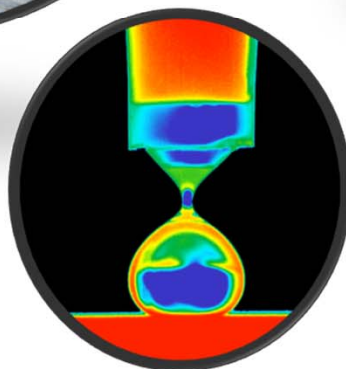
Approximately 75% of the community is:



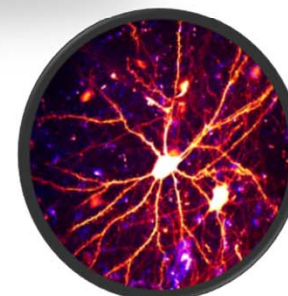
**Civil/Environmental
Engineering, 12%**



Chemical Engineering, 22%



Mechanical Engineering, 23%



**Bioengineering/Biomed
Engineering, 16%**

CMMI: Civil, Mechanical and Manufacturing Innovation

1-April-2019



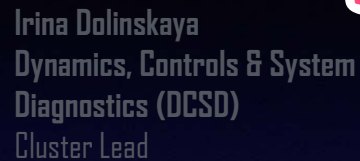
DIVISION OF CIVIL, MECHANICAL & MANUFACTURING INNOVATION

Key Points

- Support core research in advanced manufacturing; dynamics, controls & cognition; mechanics & engineering materials; engineering for civil infrastructure; and operations & design
- Make sure you have the right fit for your research topic
- Include your PD as part of your mentoring network



Program Directors





Division OF Civil, Mechanical & MANUFACTURING innovation

Mechanics & Engineering Materials

Program Directors



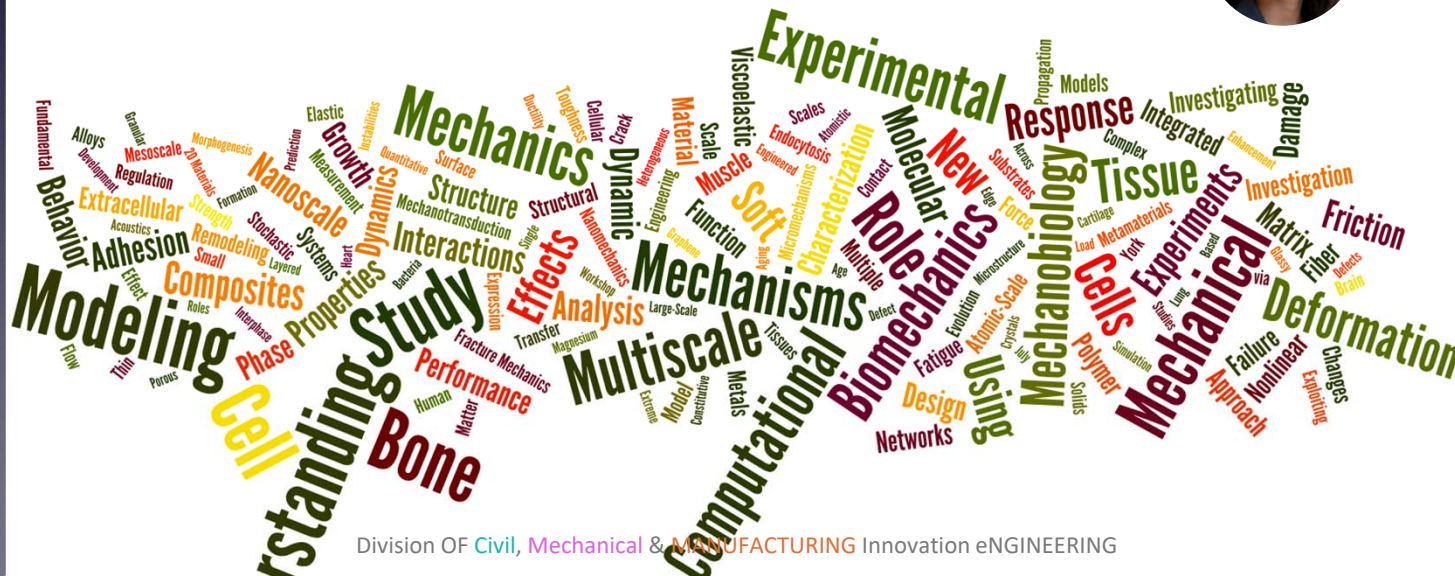
Michele Grimm
Biomechanics & Mechanobiology
(BMMB)



Siddiq Qidwai
Mechanics of Materials & Structures
(MoMS)
Cluster Lead



Nakhiah Goulbourne
(MoMS)



Operations & Design

Program Directors

Georgia-Ann Klutke
Operations Engineering
Cluster Lead



Cynthia Chen
Civil Infrastructure Systems



Future Awesome PD
Engineering Design and Systems Engineering

$\int(\text{Integrators})dt$



Bruce Kramer
Senior Advisor



Alexis Lewis
PD, advanced computing in CMMI



Jo Culbertson
PM, integrative programs



Steven Zehender
Science Analyst



Miriam Scheiber
Program Analyst



Kevin Webster
Program Analyst



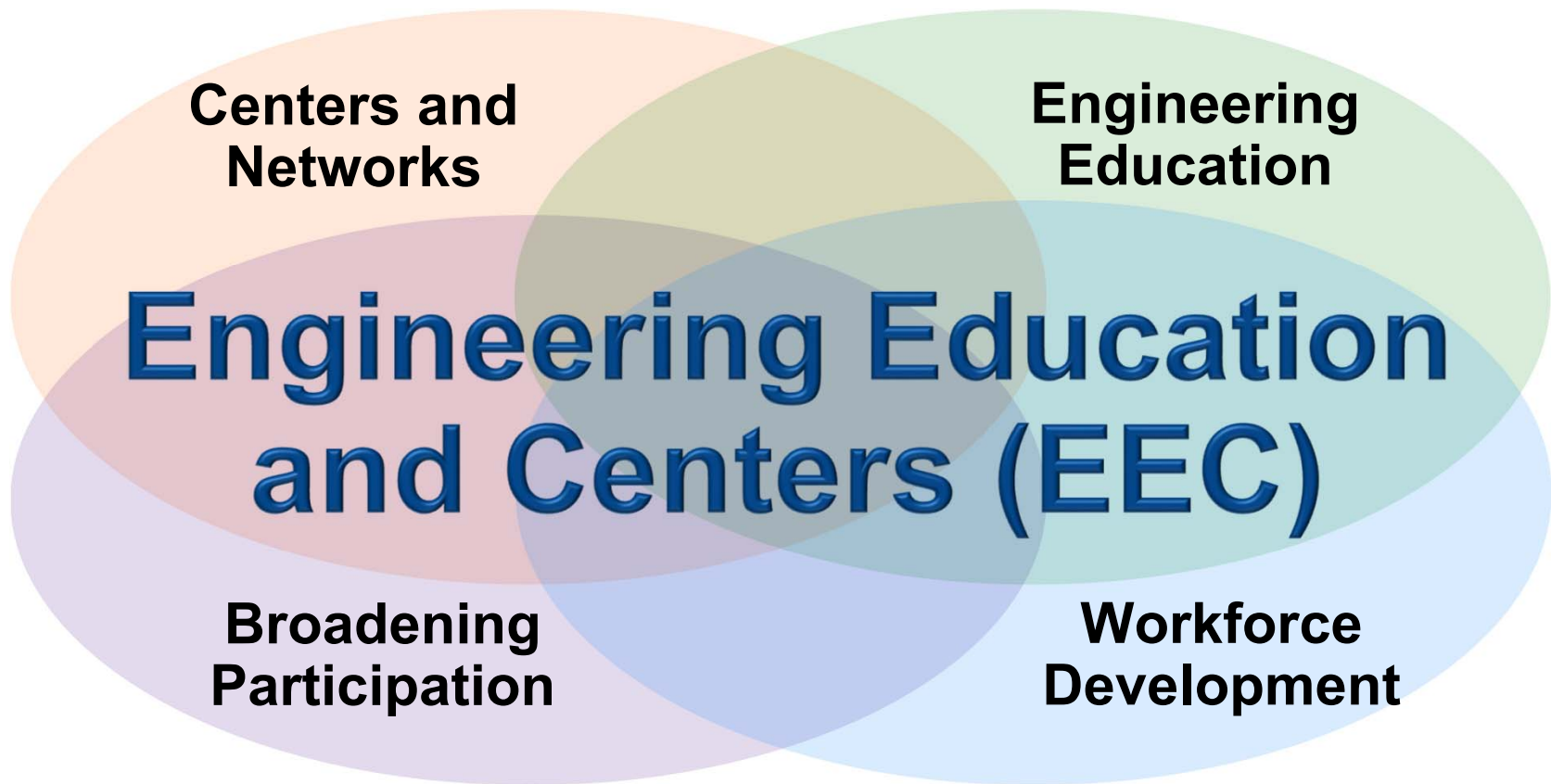
Mary Toney
Deputy Division Director



Rob Stone
Division Director

ECCS





Dr. Kon-Well Wang, Division Director
Division of Engineering Education and Centers (EEC)



Engineering Research Center (ERC) Program

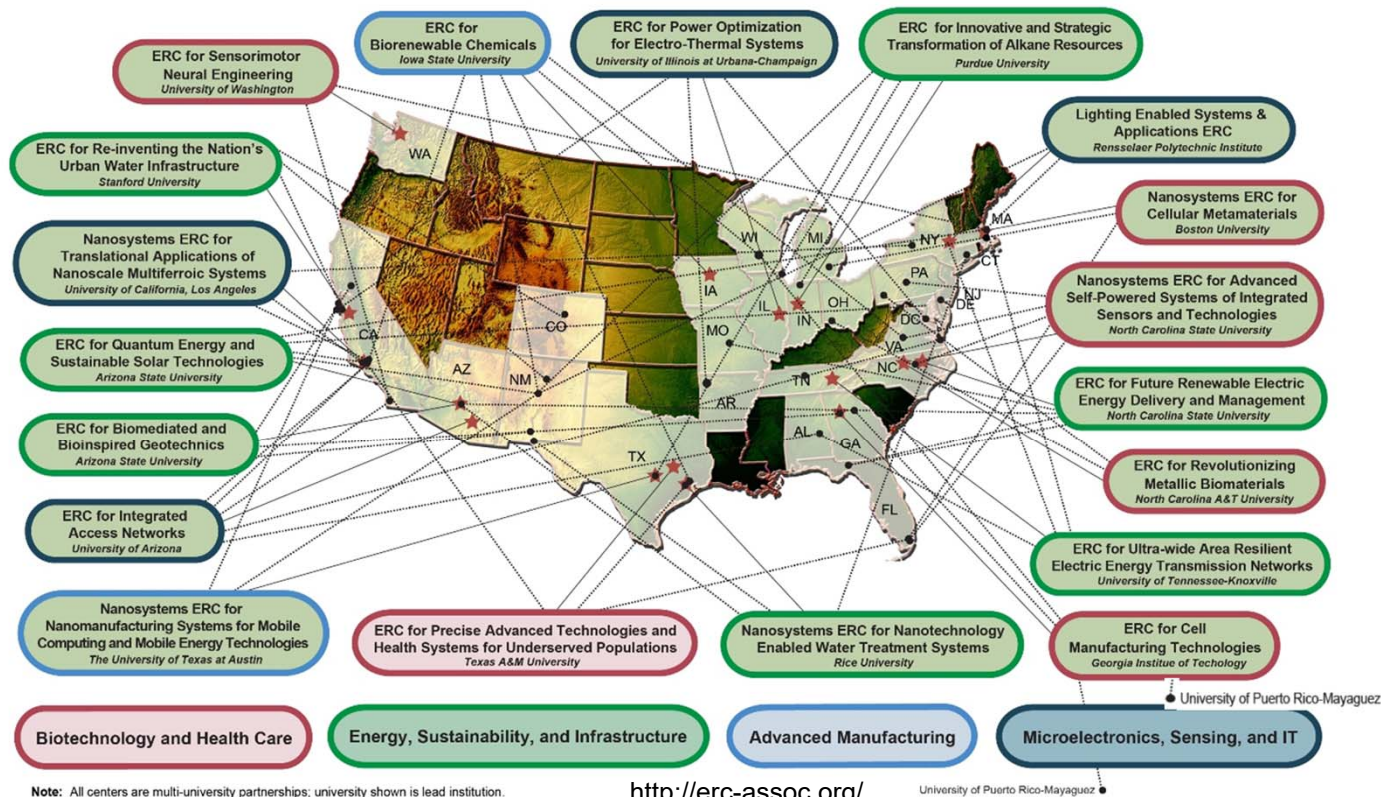
Launched in 1984 - based largely on guidelines proposed by the National Academy of Engineering (NAE) in 1983.

- Cross-discipline transformative basic research
- Translate research discovery to innovative products
- Strengthen the competitiveness of the U.S.
- Prepare next generation of technological leaders

A 10-year strategic plan with max \$4M per year in the past, now \$6M/yr.



Engineering Research Center (ERC) Program



New Gen-4 ERC:
New competition
supports convergent
research that will lead to
strong societal impact!





EEC

Engineering
Education

Engineering Education

- Fundamental research in the formation of engineers
- Translation of fundamental research into practice



Engineering Education

- CAREER in Engineering Education
- Research in the Formation of Engineers (RFE)
- Research Initiation in Engineering Formation (RIEF)
- Revolutionizing Engineering Departments (RED)



Change doesn't start
with the syllabus,
change shows up in
the syllabus



Broadening Participation

- To strengthen the future of the U.S. Engineering workforce by enabling the participation of all citizens
- Improve preparation, increase participation, and ensure contributions of underrepresented groups

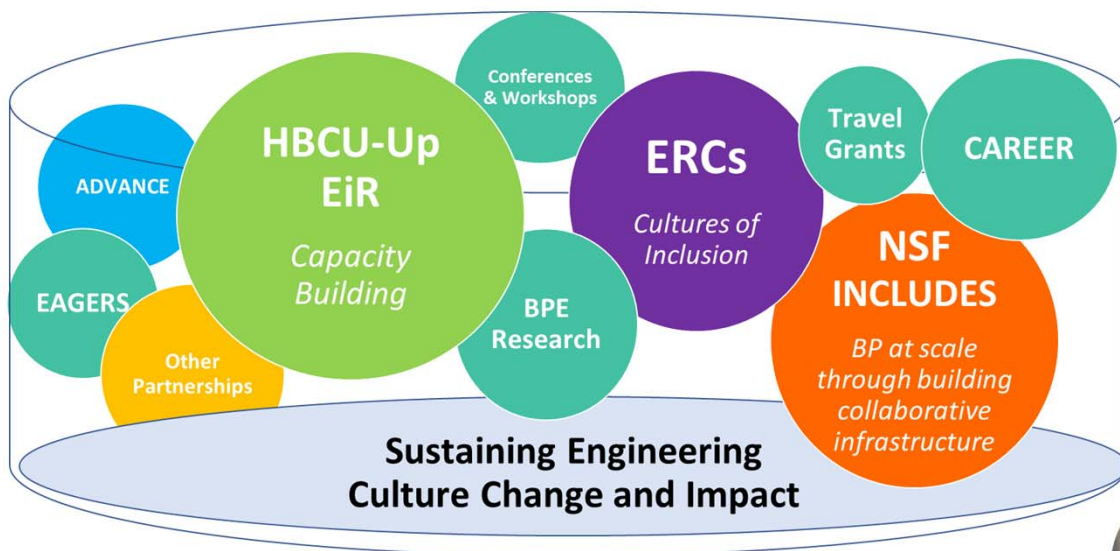


EEEC

**Broadening
Participation**



Broadening Participation in Engineering



Transform engineering cultures



Aggressively recruit and retain tenure track faculty



Innovate curriculum and teaching approaches



Increase access to engineering



Understand the barriers



Workforce Development

- Builds human capital through authentic research experiences
- Focus on undergraduates, teachers, veterans

EEC

**Workforce
Development**



IMPACT & SCALING Workforce Development

REU Sites

- 125 active REU sites across 35 states
- Over 2000 undergraduate students per year

"I'll be defending my thesis this summer, 6 years after participating in the Rice REU, and I wanted to thank you for creating that opportunity!" – Rice Univ.

"One of our former REU students has a paper in Science this week for his work on red tides in Graduate school" – Univ. of Georgia, Atlanta

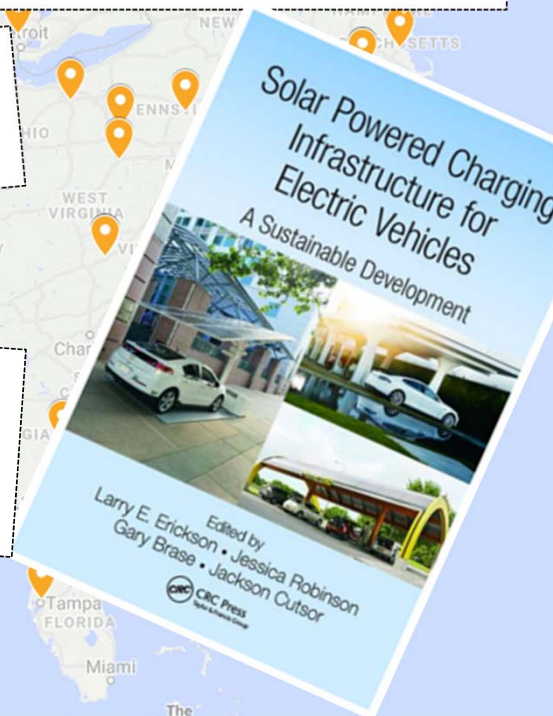
Since the REU, I've been second author on a publication, received a provisional patent and presented at two conferences." – Washington State Univ.

RET Sites

- 40 active RET sites across 27 states
- 400- 500 K-12 STEM teachers/community college faculty per year

"This specialized environment allowed students with ADHD to contribute in meaningful ways to high level scientific research while also significantly increasing their self confidence." – Univ. of Connecticut

"When we were successful in publishing the summer research with ...(REU student), we received an invitation to write a book related to the journal article." – Kansas State Univ.



Thank You!!

