Strategic Interdisciplinary Research

Sally Bond
Director, Proposal Strategy and Development
Office of Research

PURDUE UNIVERSITY

Proposal Strategy and Development

- What is the Purdue proposal development process?
- How can grant writers help you?
- What resources and tools are available?

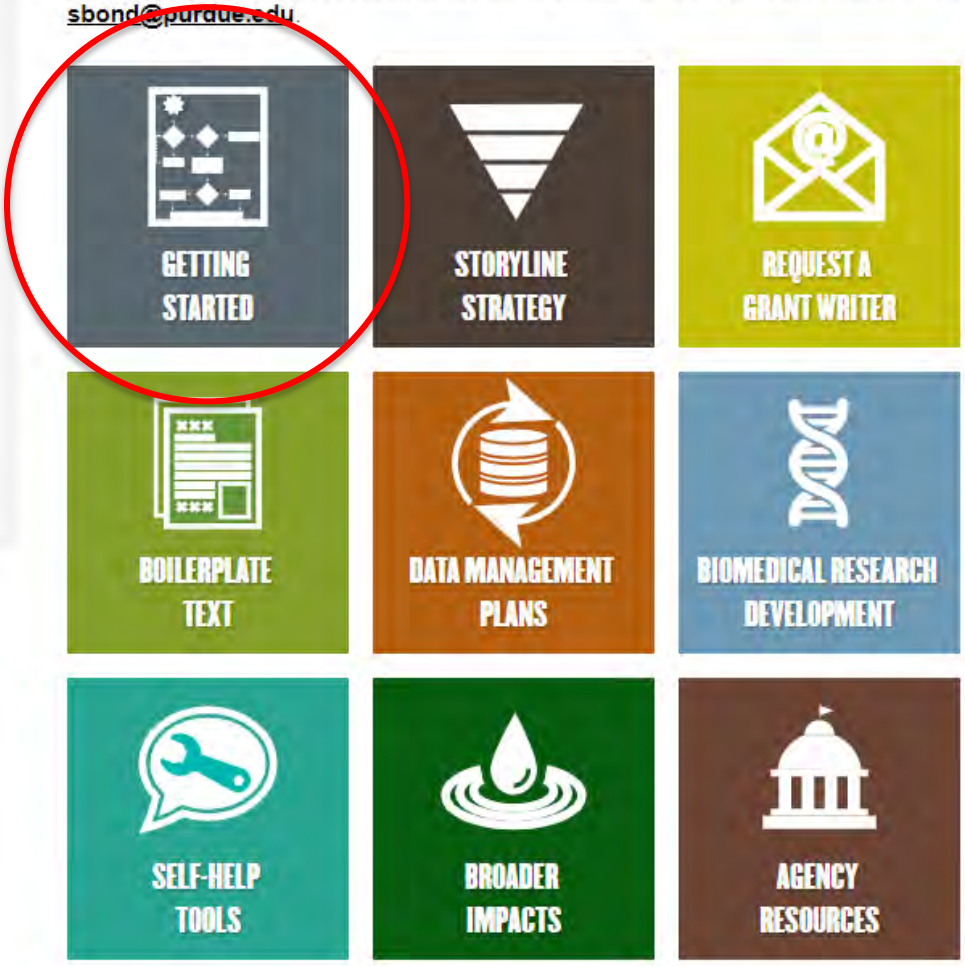
Short Cut to Grant Writing Website

Getting Started

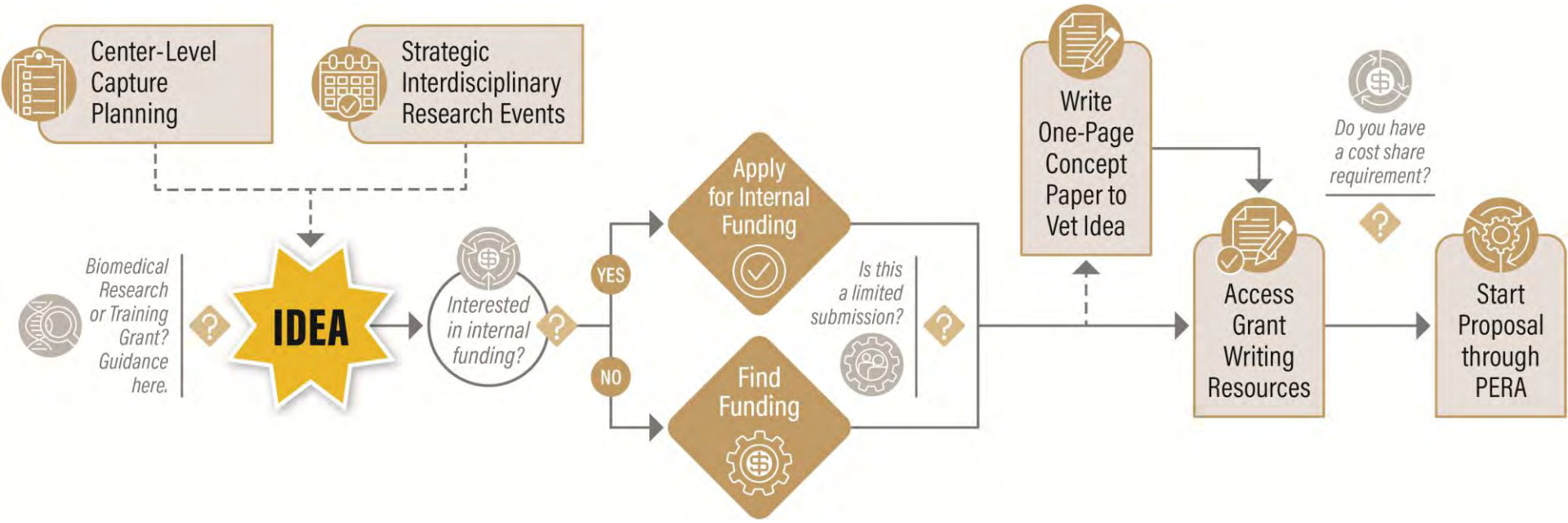
- Overview
- Getting Started
- Storyline Strategy
- Request Grant Writing Help
- Boilerplate Text
- Data Management Plans
- Biomedical Research Development
- Self-Help Tools
- Broader Impacts
- Agency Resources

Grant Writing Support

Welcome to the Research Development Services grant writing support site. Here you can access resources for your proposal development as well as request hands-on help from our team of grant writers. If you have any questions, contact **sbond@purdue.edu**.



Purdue Process Overview



Weekly Funding Newsletter

1. **Limited Submissions:**
Preproposals should be submitted via Purdue's InfoReady portal (https://purdue.infoready4.com/). For any case in which the number of preproposals received is no more than the number of proposals allowed by the sponsor, the OOR will notify the PI(s) that an internal competition will be unnecessary. Questions should be addressed to OORlimited@purdue.edu.

Limited Submission: ***NIH Modern Equipment for Shared-use Biomedical Research Facilities: Advancing Research-Related Operations (S15)*** This NOFO invites eligible academic or research institutions to apply for funding support to purchase latest scientific equipment that will enhance and modernize research-supporting operations of existing shared biomedical research facilities. Targeted are laboratory research core facilities, animal research facilities, and other similar shared-use research spaces. The goal of this NOFO is to strengthen research-auxiliary activities of biomedical research facilities and to enhance the efficiency of their operations. The NOFO does not support the purchase of scientific research instruments or their components, nor components of building-level infrastructure equipment that indirectly support research activities. Only ***one*** submission is allowed per institution.

Internal deadline: Preproposal due in InfoReady by August 26 (template)

Sponsor deadline: September 25

Limited Submission: ***University Consortium for Applied Hypersonics (UCAH): Project Call*** The Office of the Under Secretary of Defense (OUSD), Research and Engineering (R&E) Joint Hypersonics Transition Office (JHTO), in partnership with Texas A&M Engineering Experiment Station (TEES) and the UCAH, is soliciting for Prototype Project Proposals (PPPs) supporting projects that will accelerate hypersonics technology development, develop the nation's future hypersonics workforce, and facilitate the transition of ready technologies into operational capabilities. The project topics include: TOPIC 1: Rotating Detonation Engine Advancement; TOPIC 2: Durable seals for extreme environments; TOPIC 3: Seeing through high-speed turbulence for EO seekers; TOPIC 4: Directed Energy - Non-kinetic methods for integrated air and missile defense (IAMD); and TOPIC 5: UCAH 2024 Grand Challenge - Jet Interaction in Hypersonic

Sign up for the listserv by emailing **listserv@lists.purdue.edu**. Leave the subject blank and in the message body type: **subscribe Weeklyfundingopps [your_first_name] [your_last_name].** Only purdue.edu e-mail addresses will be accepted.

NSF Dear Colleague Letter: UKRI/BBSRC- NSF/BIO Lead Agency Opportunity in Biological Informatics, Systems Understanding of Host-Microbe Interactions, Synthetic Cells and Cellular Systems, and Synthetic Microbial Communities Through this Dear Colleague Letter (DCL), the NSF Directorate for Biological Sciences (NSF/BIO) and the UKRI Biotechnology and Biological Sciences Research Council (BBSRC) are pleased to announce 2024/2025 topical areas associated with this Lead Agency Opportunity. The goal of this activity is to promote transatlantic collaborative research by reducing some of the barriers that researchers may encounter. The NSF/BIO-UKRI/BBSRC Lead Agency Opportunity allows U.S. and U.K. researchers to submit a single joint proposal that will undergo a single review process. Proposers are invited to submit proposals to the Lead Agency Opportunity in 2024/2025 under one of the following research themes: Biological Informatics; Understanding host-microbe interactions; Synthetic Cells and Cellular Systems; and Synthetic Microbial Communities. Deadlines: October 31 – Expression of Interest; February 28 – Full proposal

NSF Dear Colleague Letter: Strengthening the Evidence Base Related to Broadening the Participation of LGBTQI+ Individuals in STEM This DCL aims to advance NSF's Vision of a "nation that leads the world in science and engineering research and innovation, to the benefit of all, without barriers to participation", which is closely aligned with the NSF 2022-2026 Strategic Plan and the Sexual Orientation and Gender Identity (SOGI) Data Action Plan. NSF is fully committed to the development of a future-focused science and engineering workforce that draws on the talents of all Americans, including those in the lesbian, gay, bisexual, transgender, queer, and intersex (LGBTQI+) communities. This DCL encourages four proposal types: Proposals for fundamental, use-inspired, and/or translational research and/or research syntheses; Proposals to design and deliver new conferences, colloquia, and workshops focused on research that advances education and workforce development activities related to building and/or applying the evidence base related to SOGI; Group travel proposals to support participation in existing or planned meetings and conferences aligned with the goals of this DCL; Proposals to fund activities aligned with the goals of this DCL and associated with increasing access, engagement, inclusion, and/or belonging in STEM research, workforce development, and education. Deadline: Varies

NIH Promoting Innovative Research in Treponema pallidum Pathogenesis (R21) The purpose of this NOFO is to support basic and exploratory research projects to advance our understanding of *Treponema pallidum* bacterial pathogenesis. Deadline: November 4

NIH Functional Validation and/or Characterization of Genes or Variants Implicated in Substance Use Disorders (R21/R33) The purpose of this initiative is to support projects which exploit genome or epigenome editing to functionally validate and characterize genes or variants involved in substance use disorder-relevant phenotypes. It is expected that any genetic resources generated will be made broadly available to the scientific community to enable investigation of the relevant neurobiological mechanisms involved and provide critical foundational knowledge for the development of future prevention, diagnostic, and therapeutic strategies. Deadline: March 3

DOD-DARPA Machine learning and Optimization-guided Compilers for Heterogeneous Architectures (MOCHA) MOCHA seeks to build a new generation of compiler technology to realize the full potential performance of heterogenous architectures. MOCHA will develop data-driven methods, Machine Learning, and advanced optimization techniques to rapidly adapt to new hardware components with little human effort and facilitate optimal allocation of computation to heterogeneous components. A Proposers Day will be held on August 5. Deadlines: August 22 – Abstract; September 26 - Proposal

Early Investigator Funding

- Funding Resources
- Search Tools and Alerts
- Funding Newsletters
- Early Investigator Funding
- Mid to Senior Investigator Funding
- Research Instrumentation Program
- Funding Strategies
- Limited Submissions
- Grant Writing Support
- Site Visits
- Events
- Cost Sharing
- Research Bridge Program
- DoD Travel Grants
- FAQs

Early Investigator Funding

Click on the links below for funding opportunities for Faculty and/or Post Doctoral Research.

For funding opportunities specifically geared towards graduate students, please see the Funding Information Search of The Graduate School Funding Database.

Faculty

- ACS Mentored Scholar Grant in Applied and Clinical Research
- AHRQ Career Development Grants Focused on Health Information Technology
- ASHP Foundation Research Grant
- Air Force Office of Scientific Research Young Investigator Re
- American Federation for Aging Research Grants for Junior Fa
- Army Research Office Young Investigator Program
- Alfred P. Sloan Foundation Sloan Research Fellows
- Beckman Young Investigator Program
- Blavatnik National Awards for Young Scientists (Limited)
- Brain & Behavior Research Foundation Young Investigator G
- Camille Dreyfus Teacher-Scholar Awards (Limited)

Limited Submission Process

Purdue Internal Deadlines for Proposals

Download: **Limited Submission Proposal and Review Process**

NEW PROCESS FOR LIMITED SUBMISSIONS Purdue subscribes to InfoReady for on-line management of limited submission and internal funding competitions (**https://purdue.infoready4.com/**). Internal preproposals should be submitted using this system. In InfoReady, click on the blue Purdue University Login button and use your Purdue credentials. ***On first use, click on your name in the upper, right corner and set your Primary Organization as "Purdue WL" then select your college.***

* Preproposals are required unless otherwise stated and must be received before midnight (Eastern Time) of the due date to be eligible.

Program Name	Internal Deadline	Agency Deadline(s)	Preproposal Template
NSF Test Bed: Toward a Network of Programmable Cloud Laboratories (PCL Test Bed)	9/8/25	11/20/25	Template Apply
G. Harold and Leila Y. Mathers Foundation	8/25/25	10/3/25 - LOI; 12/12/25 - Proposal	Template Apply
University Consortium for Applied Hypersonics (UCAH) Project Call	8/25/25	10/1/25 - NOI; 10/31/25 - Proposal	Template Apply
EPA Innovative Solutions for Improving Water Quality and Strengthening Local Economies in the Gulf of America Watershed	8/11/25	9/19/25	Template Apply
DOS Advancing Strategic Space Partnerships in the Middle East	8/4/25	8/25/25	Template Apply
DOS-ISN Ukraine Capacity in Intangible Technology Controls	7/28/25	8/18/25	Template Apply
DOS-ISN Impeding Chinese Communist Party Domination in	7/28/25	8/18/25	Template

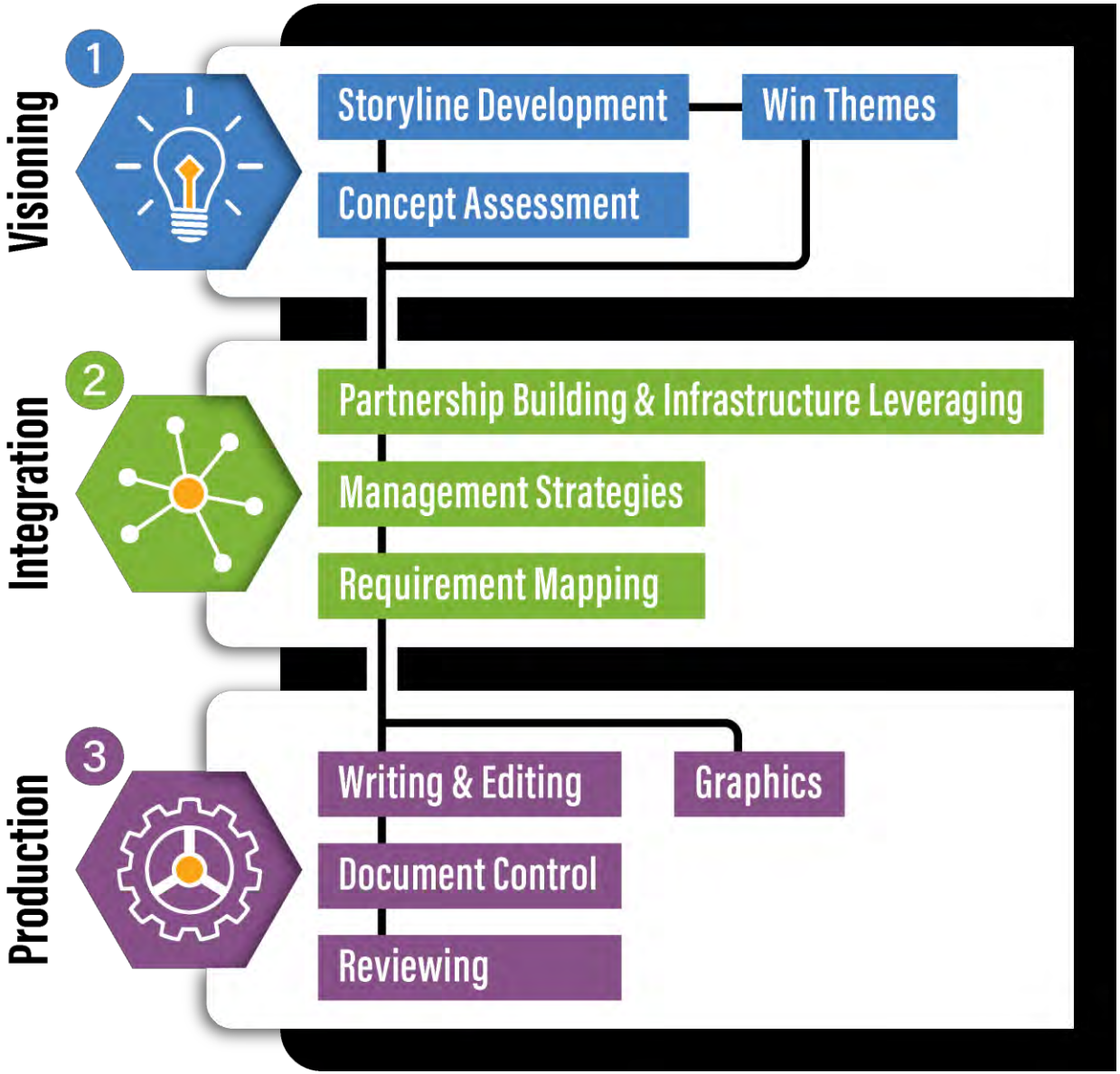
Grant Writing Assistance and Resources

- Overview
- Getting Started
- Storyline Strategy
- Request Grant Writing Help
- Boilerplate Text
- Data Management Plans
- Biomedical Research Development
- Self-Help Tools
- Broader Impacts
- Agency Resources

Grant Writing Support

Welcome to the Research Development Services grant writing support site. Here you can access resources for your proposal development as well as request hands-on help from our team of grant writers. If you have any questions, contact **sbond@purdue.edu**.

Grant Writing Strategy



Developing a Storyline

A Good Proposal Tells a Compelling Story

- Identifies an critical problem
- Provides rationale and coherence for your particular approach
- Hooks reviewers with timeliness and impact

Developing a Storyline

Logic Flow

- What is the problem?
- What has been done already to address this problem?
- What is the gap that still remains?
- How do you propose to address this gap?

Developing a Storyline

Logic Flow

- What is the problem?
- What has been done already to address this problem?
- What is the gap that still remains?
- How do you propose to address this gap?

Storyline to Concept Paper

Preparing for a Successful Meeting with Your Program Officer

You are more likely to receive valuable insight into the funding potential of your idea if you follow these steps:

- Make contact early (at least several months in advance).
- Do not make a "cold call." Email a one-page concept paper along with your agency biosketch and request a phone appointment to discuss.
- Develop your concept paper using the format below. Grant writers in the Office of Research and Partnerships can help you develop this text. Email sbond@purdue.edu to request help.

Why a one-pager? Distilling your ideas into a brief summary — one that starts with a compelling storyline — will best communicate project relevance, highlight the logic of your approach, and allow targeted rather than general feedback. Many program officers will not read more than one page since multiple pages represent a proposal review rather than an idea review. While you will not be told if you are "fundable," the program officer can assess for program fit.

For NIH Use Specific Aims Page

Start with storyline:

- What is the human health problem?
- What has been done already to address this problem?
- What is the gap that still exists?
- How do you propose to address this gap?

Briefly mention why this team is ideal for the project.

Aim X: Use a bold, concrete objective for each aim. Describe each aim in one to three sentences that convey why this work needs to be done as well as what and how.

End with paragraph on expected outcomes.

For All Other Funding Agencies Use Concept Page

Start with storyline:

- What is the problem?
- What has been done already to address this problem?
- What is the gap that still exists?
- How do you propose to address this gap?

List your goals/objectives.

Describe why this team is ideal for the project.

Overview methodology.

Summarize impact of your success.

PURDUE UNIVERSITY | Office of the Executive Vice President for Research and Partnerships

EA/EOU 4/19

Storyline to Concept Paper

INFEWS/T2: Identifying Sustainability Solutions through Global-Local-Global Analysis of a Coupled Water-Agriculture-Bioenergy System

The global Food-Energy-Water (FEW) system is under increasing pressure to meet rising demands for food, energy, and water while maintaining ecosystem services provided by natural lands and waters. With growing population, rising per capita incomes, and climate change, researchers predict unprecedented resource challenges in the next 30 years. Global crop output is expected to increase by anywhere from 70% to more than 100%; global freshwater demand by 55% as one of the most fiercely contested resources; and global bioenergy demand by more than 1,000%. These challenges are interconnected—both across systems and across scales—so that addressing one system or location will inevitably cascade into others. Decision makers without the capacity to factor in these interconnections risk inadvertently pursuing unsustainable solutions and unintended consequences flowing from FEW system interventions.

Research has focused on analyzing effects within socioeconomic systems and within natural systems and is moving toward increased integration that emphasizes the role of spillover effects from one system to another. Global integrated assessment modeling research provided critical inputs to address tradeoffs between alternative sustainability solutions. However, such analyses typically omit at least one of the four systems— food security, bioenergy, water quality, and groundwater scarcity—and do not account for socioecological feedbacks. As a result, despite significant investments made by the integrated assessment communities at both global and regional scales, ***a critical research gap*** remains in our ability to assess sustainability solutions that have ***both cross-system and cross-scale components***. The absence of feedback from local actions to regional, national, and global effects makes it nearly impossible to achieve a complete analysis of tradeoffs associated with alternative policy and management interventions.

We will address this knowledge gap by building an integrative framework for analysis of FEWS solutions that highlights synergies and tradeoffs resulting from multiple policy levers and thereby allows the development of more comprehensive sustainability solutions. We will begin with the analysis of individual interventions (levers) and progress to multiple interventions that reveal how policy levers interact across systems and scales for a Global to Local to Global community of practice. Our three goals are to:

- **Goal 1. Single-lever analysis**: Establish system behavior and identify the performance of individual levers and feedbacks to the larger integrated system via cascading pathways of impacts.
- **Goal 2. Multiple-lever analysis:** Using the integrated system, identify high-performing strategies composed of multiple levers that reveal the trade-offs, synergies, and economic costs associated with managing FEWS challenges.
- **Goal 3. Community of Practice:** Foster development of a community of practice utilizing Global-Local-Global methods to examine integrative solutions to these FEWS challenges.

Method

Our open-source framework will strategically build on a portfolio of internationally vetted tools we have previously authored as global models of hydrology and water quality (WBM), food systems (SIMPLE-G), bioenergy (ENVISAGE), and U.S. agro-ecology (Agro-IBIS). Our experienced, interdisciplinary team of researchers have a history of productive collaboration across areas of global economic analysis of agriculture and environmental issues, policy trade-offs, and synergies associated with sustainability challenges, hydrology, and water quality. Our novel geospatial science gateway GeoHub will provide a proven cyber platform to accelerate progress toward project milestones.

Why Us?

Impact

The proposed system of systems will allow us to evaluate trade-offs and synergies across the FEW system for a suite of sustainability solutions. This framework will inform local/regional decision-making about sustainability goals by developing an open source, gridded FEW modeling system. Powered by NSF-funded technologies GeoHub on HUBzero and utilize GABBs (geospatial data building blocks), as well as the XSEDE computational backbone, the framework will allow fine-scale analysis across broad geographies. We will analyze global drivers of local sustainability stresses as well as feedbacks to national and international levels stemming from local adaptations to national/international FEWS stressors. This will deliver a more complete analysis of tradeoffs associated with different policies and pathways. Education and outreach on the GeoHub will provide spatial analysis capabilities to stakeholders and non-experts without requiring local software resources.

Drop-in Text for Resource/Facilities

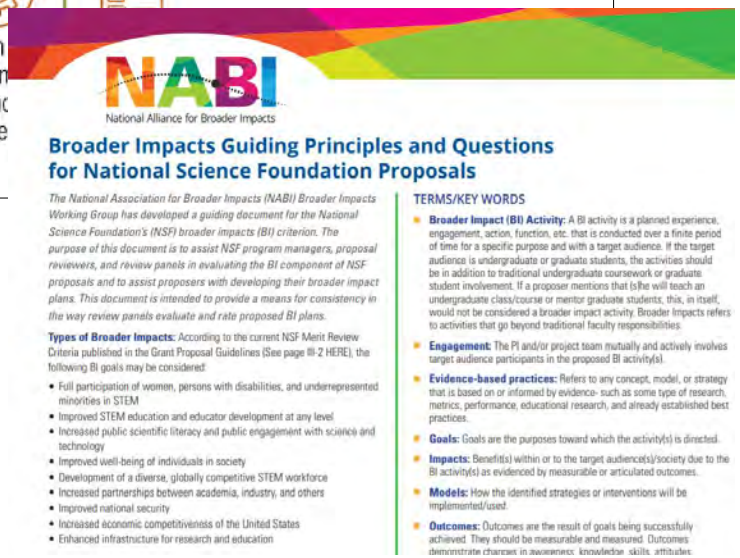
Broader Impacts & Broadening Participation

Steps to an Education and Workforce Development Plan

The Best Education and Workforce Development (EWD) Plans:

- Are tailored to the specific research
- Are sustainable and scalable
- Include the right expertise
- Leverage institutional resources
- Have rationale from the literature
- Advance diversity, equity, and inclusion when possible
- Add an appropriate budget
- Do not name partners without permission

Click each step for details.



NABI

National Alliance for Broader Impacts

Broader Impacts Guiding Principles and Questions for National Science Foundation Proposals

The National Association for Broader Impacts (NABI) Broader Impacts Working Group has developed a guiding document for the National Science Foundation's (NSF) broader impacts (BI) criterion. The purpose of this document is to assist NSF program managers, proposal reviewers, and review panels in evaluating the BI component of NSF proposals and to assist proposers with developing their broader impact plans. This document is intended to provide a means for consistency in the way review panels evaluate and rate proposed BI plans.

Types of Broader Impacts: According to the current NSF Merit Review Criteria published in the Grant Proposal Guidelines (See page III-2 HERE), the following BI goals may be considered:

- Full participation of women, persons with disabilities, and underrepresented minorities in STEM
- Improved STEM education and educator development at any level
- Increased public scientific literacy and public engagement with science and technology
- Improved well-being of individuals in society
- Development of a diverse, globally competitive STEM workforce
- Increased partnerships between academia, industry, and others
- Improved national security
- Increased economic competitiveness of the United States
- Enhanced infrastructure for research and education

TERMS/KEY WORDS

- **Broader Impact (BI) Activity:** A BI activity is a planned experience, engagement, action, function, etc. that is conducted over a finite period of time for a specific purpose and with a target audience. If the target audience is undergraduate or graduate students, the activities should be in addition to traditional undergraduate coursework or graduate student involvement. If a proposer mentions that (s)he will teach an undergraduate class/course or mentor graduate students, this, in itself, would not be considered a broader impact activity. Broader Impacts refers to activities that go beyond traditional faculty responsibilities.
- **Engagement:** The PI and/or project team mutually and actively involves target audience participants in the proposed BI activity(s).
- **Evidence-based practices:** Refers to any concept, model, or strategy that is based on or informed by evidence- such as some type of research, metrics, performance, educational research, and already established best practices.
- **Goals:** Goals are the purposes toward which the activity(s) is directed.
- **Impacts:** Benefit(s) within or to the target audience(s)/society due to the BI activity(s) as evidenced by measurable or articulated outcomes.
- **Models:** How the identified strategies or interventions will be implemented/used.
- **Outcomes:** Outcomes are the result of goals being successfully achieved. They should be measurable and measured. Outcomes demonstrate changes in awareness, knowledge, skills, attitudes

Sample Data Management Plans

DMP Development Resources

- **Purdue Libraries Data Management Guidelines**
- **Purdue-Affiliated dmptool.org** for data management plans templates, sample documents, and funder guidance.
- **Purdue's Research Repository (PURR)** contains step-by-step instructions for completing the data management plan requirements and citable boilerplate text that can be inserted into your DMP.
- **Data Storage Options at Purdue** explains different data storage options available to the Purdue community

Sample DMPs from funded Purdue projects

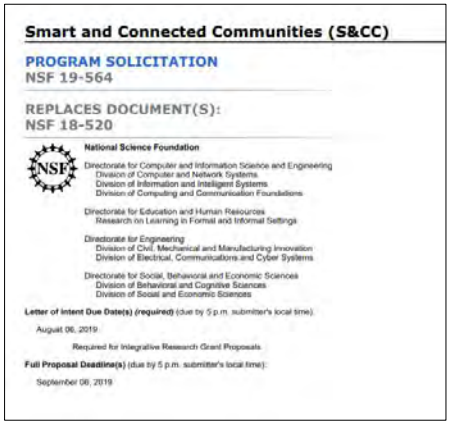
NSF Division of Engineering Education and Centers (CISTAR 2017)
NASA Space Technologies Research Institutes (Dyke 2019)
NSF Division of Behavorial and Cognitive Sciences (Ma 2017)
NSF Division of Research on Learning (Ryu 2018)

Ask for Grant Writing Help

- Any award size*
- Any agency
- External proposals only
- When? Sooner is better
- Concept storylines to shop your idea
- Email GrantHelp@purdue.edu

What do Grant Writers Do?

What do Grant Writers Do?



Smart and Connected Communities (S&CC)

PROGRAM SOLICITATION
NSF 19-564

REPLACES DOCUMENT(S):
NSF 18-520

National Science Foundation

Directorate for Computer and Information Science and Engineering
Division of Computer and Network Systems
Division of Information and Intelligent Systems
Division of Computing and Communication Foundations

Directorate for Education and Human Resources
Research on Learning in Formal and Informal Settings

Directorate for Engineering
Division of Civil, Mechanical and Manufacturing Innovation
Division of Electrical, Communications and Cyber Systems

Directorate for Social, Behavioral and Economic Sciences
Division of Behavioral and Cognitive Sciences
Division of Social and Economic Sciences

Letter of Intent Due Date(s) *(required)* (due by 5 p.m. submitter's local time):

August 06, 2019

Required for Integrative Research Grant Proposals

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

September 06, 2019

What do Grant Writers Do?

General 10-week project timeline:

	1	2	3	4	5	6	7	8	9	10
Analysis and Planning										
Distribute documents noted in RFP										
Identify previously successful proposals										
Identify PI										
Notify Pre-Award Center for assigned budget specialist										
Problem Overview • *What is the problem* • *What has already been done to address problem* • *What gaps remain* • *How we propose to address gaps*										
Vision										
Goals										
Identify proposal win themes/discriminators										
Program Officer Input										
Contact PO	initial									
Team debrief on meeting										
Refine initial analysis/planning										
Proposed Outline										
Discuss/refine outline structure										
More detailed outline, if needed										
Identify graphics needed										
Partnerships										
Recruit collaborative partners										
Produce "talking points" brochure or website										
Recruit industry affiliates										
Recruit advisory board members										
Collect letters of commitment										
Management and Personnel										
Identify basic management structure										
Collect biosketches										
Proposal Writing and Editing										
Assign writing										
Write section components										
Compile 1st draft										
Project team 1st edit										
Any outside review input/edit										
Editing iterations										
Write summary or abstract										

Red Text: Important to have agreement (and explicit text for problem overview) prior to proposal writing

Smart and Connected Communities (S&CC)

PROGRAM SOLICITATION
NSF 19-564

REPLACES DOCUMENT(S):
NSF 18-520

National Science Foundation

Directorate for Computer and Information Science and Engineering
Division of Computer and Network Systems
Division of Information and Intelligent Systems
Division of Computing and Communication Foundations

Directorate for Education and Human Resources
Research on Learning in Formal and Informal Settings

Directorate for Engineering
Division of Civil, Mechanical and Manufacturing Innovation
Division of Electrical, Communications and Cyber Systems

Directorate for Social, Behavioral and Economic Sciences
Division of Behavioral and Cognitive Sciences
Division of Social and Economic Sciences

Letter of Intent Due Date(s) (required) (due by 5 p.m. submitter's local time):

August 06, 2019

Required for Integrative Research Grant Proposals.

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

September 06, 2019

What do Grant Writers Do?

General 10-week project timeline:

	1	2	3	4	5	6	7	8	9	10
Analysis and Planning										
Distribute documents noted in RFP										
Identify previously successful proposals										
Identify PI										
Notify Pre-Award Center for assigned budget specialist										
Problem Overview • *What is the problem* • *What has already been done to address problem* • *What gaps remain* • *How we propose to address gaps*										
Vision										
Goals										
Identify proposal win themes/discriminators										
Program Officer Input										
Contact PO	initial									
Team debrief on meeting										
Refine initial analysis/planning										
Proposed Outline										
Discuss/refine outline structure										
More detailed outline, if needed										
Identify graphics needed										
Partnerships										
Recruit collaborative partners										
Produce "talking points" brochure or website										
Recruit industry affiliates										
Recruit advisory board members										
Collect letters of commitment										
Management and Personnel										
Identify basic management structure										
Collect biosketches										
Proposal Writing and Editing										
Assign writing										
Write section components										
Compile 1st draft										
Project team 1st edit										
Any outside review input/edit										
Editing iterations										
Write summary or abstract										

mportant to have agreement (and explicit text for problem overview) prior to proposal writing

What is the problem?
What has been done already to address this problem?
What is the gap that still remains?
How do you propose to address this gap?

Light microscopy allows direct observation of living specimens with molecular specificity [1]; however, the diffraction limit restricts the resolution of conventional light microscopy to ~250 nm [2]. This century-old barrier has restricted our understanding of protein functions, interactions, and dynamics in the cellular context particularly at the sub-microns to nanometers length scale. Single molecule switching nanoscopy (**SMSN or PALM/STORM**) has overcome this fundamental limit and allows visualization of biological phenomena never seen before [3, 4].

However, both **custom-built** and **commercially available** SMSN is still far from being a standard tool in biomedical research with practical usefulness severely limited due to:

- **Slow speed.** Traditional SMSN systems take minutes to hours to acquire an image, whereas many cellular events occur at the second time scale [5].
- **Limited to 2D and thin samples.** Many biological processes happen deeper in the cellular volume or in thick tissue samples, which cannot be resolved with conventional SMSN [6].
- **Phototoxicity.** Traditional SMSN requires laser intensity in the range of ~ 1-15 kW/cm² generating large triplet state electron populations and therefore free radical species damaging cells and tissues [7].
- **Strong reliance on user's expertise.** SMSN captures abundant but isolated emitters from probes with distinct switching behavior and requires extensive user expertise. Data analysis and visualization demands computational expertise and is time consuming [4]. This lack of an autonomous acquisition, analysis, and visualization solution causes significant performance differences among samples,

itching Nanoscopy (**W-**
combines **light-sheet**
croscope with speed
alysis. We will provide
res and dynamics in a

Smart and Connected Communities (S&CC)

PROGRAM SOLICITATION
NSF 19-564

REPLACES DOCUMENT(S):
NSF 18-520

National Science Foundation

Directorate for Computer and Information Science and Engineering
Division of Computer and Network Systems
Division of Information and Intelligent Systems
Division of Computing and Communication Foundations

Directorate for Education and Human Resources
Research on Learning in Formal and Informal Settings

Directorate for Engineering
Division of Civil, Mechanical and Manufacturing Innovation
Division of Electrical, Communications and Cyber Systems

Directorate for Social, Behavioral and Economic Sciences
Division of Behavioral and Cognitive Sciences
Division of Social and Economic Sciences

Letter of Intent Due Date(s) (required) (due by 5 p.m. submitter's local time):

August 06, 2019

Required for Integrative Research Grant Proposals.

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

September 06, 2019

What do Grant Writers Do?

General 10-week project timeline:

	1	2	3	4	5	6	7	8	9	10
Analysis and Planning										
Distribute documents noted in RFP										
Identify previously successful proposals										
Identify PI										
Notify Pre-Award Center for assigned budget specialist										
Problem Overview										
• *What is the problem*										
• *What has already been done to address problem*										
• *What gaps remain*										
• *How we propose to address gaps*										
Vision										
Goals										
Identify proposal win themes/discriminators										
Program Officer Input										
Contact PO	initial									
Team debrief on meeting										
Refine initial analysis/planning										
Proposed Outline										
Discuss/refine outline structure										
More detailed outline, if needed										
Identify graphics needed										
Partnerships										
Recruit collaborative partners										
Produce "talking points" brochure or website										
Recruit industry affiliates										
Recruit advisory board members										
Collect letters of commitment										
Management and Personnel										
Identify basic management structure										
Collect biosketches										
Proposal Writing and Editing										
Assign writing										
Write section components										
Compile 1st draft										
Project team 1st edit										
Any outside review input/edit										
Editing iterations										
Write summary or abstract										

important to have agreement (and explicit text for problem overview) prior to proposal writing

What is the problem?
What has been done already to address this problem?
What is the gap that still remains?
How do you propose to address this gap?

Light microscopy allows direct observation of living specimens with molecular specificity [1]; however, the diffraction limit restricts the resolution of conventional light microscopy to ~250 nm [2]. This century-old barrier has restricted our understanding of protein functions, interactions, and dynamics in the cellular context particularly at the sub-microns to nanometers length scale. Single molecule switching nanoscopy (**SMSN or PALM/STORM**) has overcome this fundamental limit and allows visualization of biological phenomena never seen before [3, 4].

However, both **custom-built** and **commercially available** SMSN is still far from being a standard tool in biomedical research with practical usefulness severely limited due to:

- **Slow speed.** Traditional SMSN systems take minutes to hours to acquire an image, whereas many cellular events occur at the second time scale [5].
- **Limited to 2D and thin samples.** Many biological processes happen deeper in the cellular volume or in thick tissue samples, which cannot be resolved with conventional SMSN [6].
- **Phototoxicity.** Traditional SMSN requires laser intensity in the range of ~ 1-15 kW/cm² generating large triplet state electron populations and therefore free radical species damaging cells and tissues [7].
- **Strong reliance on user's expertise.** SMSN captures abundant but isolated emitters from probes with distinct switching behavior and requires extensive user expertise. Data analysis and visualization demands computational expertise and is time consuming [4]. This lack of an autonomous acquisition, analysis, and visualization solution causes significant performance differences among samples,

Smart and Connected Communities (S&CC)

PROGRAM SOLICITATION
NSF 19-564

REPLACES DOCUMENT(S):
NSF 18-520

National Science Foundation

Directorate for Computer and Information Science and Engineering
Division of Computer and Network Systems
Division of Information and Intelligent Systems
Division of Computing and Communication Foundations

Directorate for Education and Human Resources
Research on Learning in Formal and Informal Settings

Directorate for Engineering
Division of Civil, Mechanical and Manufacturing Innovation
Division of Electrical, Communications and Cyber Systems

Directorate for Social, Behavioral and Economic Sciences
Division of Behavioral and Cognitive Sciences
Division of Social and Economic Sciences

Letter of Intent Due Date(s) (required) (due by 5 p.m. submitter's local time):

August 06, 2019

Required for Integrative Research Grant Proposals

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

September 06, 2019

Preparing for a Successful Meeting with Your Program Officer

You are more likely to receive valuable insight into the funding potential of your idea if you follow these steps:

- Make contact early (at least several months in advance).
- Do not make a "cold call." Email a one-page concept paper along with your agency biosketch and request a phone appointment to discuss.
- Develop your concept paper using the format below. Grant writers in the Office of Research and Partnerships can help you develop this text. Email sbond@purdue.edu to request help.

Why a one-pager? Distilling your ideas into a brief summary — one that starts with a compelling storyline — will best communicate project relevance, highlight the logic of your approach, and allow targeted rather than general feedback. Many program officers will not read more than one page since multiple pages represent a proposal review rather than an idea review. While you will not be told if you are "fundable," the program officer can assess for program fit.

For NIH Use Specific Aims Page

Start with storyline:
- What is the human health problem?
- What has been done already to address this problem?
- What is the gap that still exists?
- How do you propose to address this gap?

Briefly mention why this team is ideal for the project.

Aim X: Use a bold, concrete objective for each aim. Describe each aim in one to three sentences that convey why this work needs to be done as well as what and how.

End with paragraph on expected outcomes.

For All Other Funding Agencies Use Concept Page

Start with storyline:
- What is the problem?
- What has been done already to address this problem?
- What is the gap that still exists?
- How do you propose to address this gap?

List your goals/objectives.

Describe why this team is ideal for the project.

Overview methodology.

Summarize impact of your success.

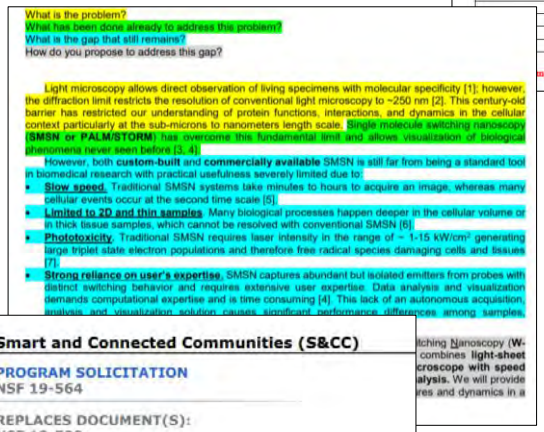
PURDUE UNIVERSITY | Office of the Executive Vice President for Research and Partnerships

What do Grant Writers Do?

General 10-week project timeline:

	1	2	3	4	5	6	7	8	9	10
Analysis and Planning										
Distribute documents noted in RFP										
Identify previously successful proposals										
Identify PI										
Notify Pre-Award Center for assigned budget specialist										
Problem Overview										
• *What is the problem*										
• *What has already been done to address problem*										
• *What gaps remain*										
• *How we propose to address gaps*										
Vision										
Goals										
Identify proposal win themes/discriminators										
Program Officer Input										
Contact PO	initial									
Team debrief on meeting										
Refine initial analysis/planning										
Proposed Outline										
Discuss/refine outline structure										
More detailed outline, if needed										
Identify graphics needed										
Partnerships										
Recruit collaborative partners										
Produce "talking points" brochure or website										
Recruit industry affiliates										
Recruit advisory board members										
Collect letters of commitment										
Management and Personnel										
Identify basic management structure										
Collect biosketches										
Proposal Writing and Editing										
Assign writing										
Write section components										
Compile 1st draft										
Project team 1st edit										
Any outside review input/edit										
Editing iterations										
Write summary or abstract										

portant to have agreement (and explicit text for problem overview) prior to proposal writing



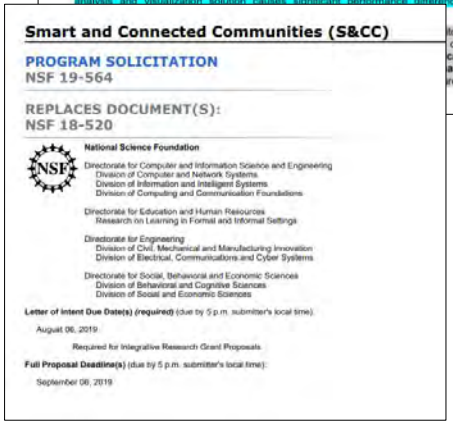
What is the problem?
What has been done already to address this problem?
What is the gap that still remains?
How do you propose to address this gap?

Light microscopy allows direct observation of living specimens with molecular specificity [1]; however, the diffraction limit restricts the resolution of conventional light microscopy to ~250 nm [2]. This century-old barrier has restricted our understanding of protein functions, interactions, and dynamics in the cellular context particularly at the sub-microns to nanometers length scale. Single molecule switching nanoscopy (**SMSN or PALM/STORM**) has overcome this fundamental limit and allows visualization of biological phenomena never seen before [3, 4].

However, both **custom-built** and **commercially available** SMSN is still far from being a standard tool in biomedical research with practical usefulness severely limited due to:

- **Slow speed.** Traditional SMSN systems take minutes to hours to acquire an image, whereas many cellular events occur at the second time scale [5].
- **Limited to 2D and thin samples.** Many biological processes happen deeper in the cellular volume or in thick tissue samples, which cannot be resolved with conventional SMSN [6].
- **Phototoxicity.** Traditional SMSN requires laser intensity in the range of ~ 1-15 kW/cm² generating large triplet state electron populations and therefore free radical species damaging cells and tissues [7].
- **Strong reliance on user's expertise.** SMSN captures abundant but isolated emitters from probes with distinct switching behavior and requires extensive user expertise. Data analysis and visualization demands computational expertise and is time consuming [4]. This lack of an autonomous acquisition, analysis, and visualization solution causes significant performance differences among samples,

tching Nanoscopy (**W-**
combines **light-sheet**
croscope with speed
alysis. We will provide
res and dynamics in a



Smart and Connected Communities (S&CC)

PROGRAM SOLICITATION
NSF 19-564

REPLACES DOCUMENT(S):
NSF 18-520

National Science Foundation

Directorate for Computer and Information Science and Engineering
Division of Computer and Network Systems
Division of Information and Intelligent Systems
Division of Computing and Communication Foundations

Directorate for Education and Human Resources
Research on Learning in Formal and Informal Settings

Directorate for Engineering
Division of Civil, Mechanical and Manufacturing Innovation
Division of Electrical, Communications and Cyber Systems

Directorate for Social, Behavioral and Economic Sciences
Division of Behavioral and Cognitive Sciences
Division of Social and Economic Sciences

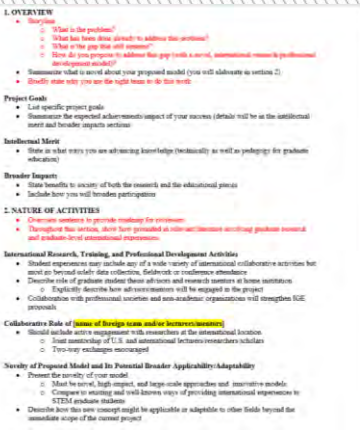
Letter of Intent Due Date(s) *(required)* (due by 5 p.m. submitter's local time):

August 06, 2019

Required for Integrative Research Grant Proposals.

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

September 06, 2019



1. OVERVIEW
- Storyline
  - What is the problem?
  - What has been done already to address this problem?
  - What is the gap that still remains?
  - How do you propose to address this gap (with a novel, international research/professional development model)?
- Summarize what is novel about your proposed model (you will elaborate in section 2).
- Briefly state why you are the right team to do this work.

Project Goals
- List specific project goals.
- Summarize the expected advancements/impact of your success (details will be in the intellectual merit and broader impacts sections).

Intellectual Merit
- State in what ways you are advancing knowledge (technically as well as pedagogy for graduate education)

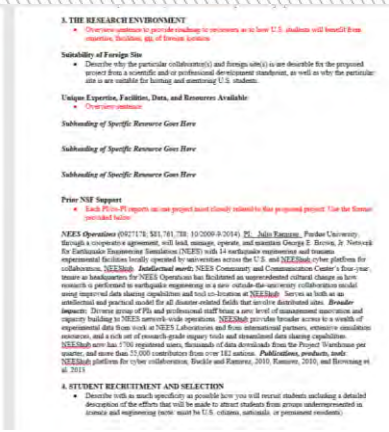
Broader Impacts
- State benefits to society of both the research and the educational pieces.
- Include how you will broaden participation.

2. NATURE OF ACTIVITIES
- Overview sentence to provide roadmap for reviewers.
- Throughout this section, show how grounded in relevant literature involving graduate research and graduate-level international experiences.

International Research, Training, and Professional Development Activities
- Student experiences may include any of a wide variety of international collaborative activities but must go beyond solely data collection, fieldwork or conference attendance.
- Describe role of graduate student (how advisors and research mentors at home institution
  - Explicitly describe how advisors/mentors will be engaged in the project
- Collaboration with professional societies and non-academic organizations will strengthen IGE proposals

Collaborative Role of [name of foreign team and/or lecturers/mentors]
- Should include active engagement with researchers at the international location.
  - Joint mentorship of U.S. and international lecturers/researchers/scholars
  - Two-way exchanges encouraged

Novelty of Proposed Model and Its Potential Broader Applicability/Adaptability
- Present the novelty of your model.
  - Must be novel, high-impact, and large-scale approaches and innovative models.
  - Compare to existing and well-known ways of providing international experiences to STEM graduate students
- Describe how this new concept might be applicable or adaptable to other fields beyond the immediate scope of the current project



3. THE RESEARCH ENVIRONMENT
- Overview sentence to provide roadmap for reviewers as to how U.S. students will benefit from expertise, facilities, etc. of foreign location

Suitability of Foreign Site
- Describe why the particular collaborator(s) and foreign site(s) is are desirable for the proposed project from a scientific and/or professional development standpoint, as well as why the particular site is are suitable for hosting and mentoring U.S. students.

Unique Expertise, Facilities, Data, and Resources Available
- Overview sentence

Subheading of Specific Resource Goes Here

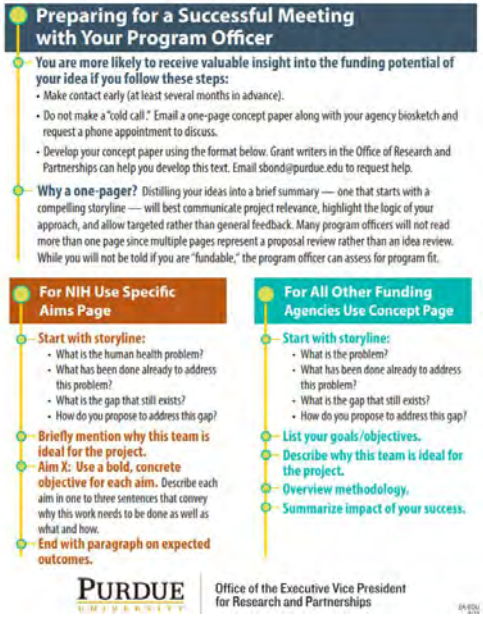
Subheading of Specific Resource Goes Here

Subheading of Specific Resource Goes Here

Prior NSF Support
- Each PI/co-PI reports on one project most closely related to this proposed project. Use the format provided below.

NEES Operations (0927178; $81,761,788; 10/2009-9/2014). PI: Julio Ramirez, Purdue University, through a cooperative agreement, will lead, manage, operate, and maintain George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) with 14 earthquake engineering and tsunami experimental facilities locally operated by universities across the U.S. and NEEShub cyber platform for collaboration, NEEShub. *Intellectual merit:* NEES Community and Communication Center's four-year tenure as headquarters for NEES Operations has facilitated an unprecedented cultural change as how research is performed in earthquake engineering in a new outside-the-university collaboration model using improved data sharing capabilities and tool co-location at NEEShub. Serves as both as an intellectual and practical model for all disaster-related fields that involve distributed sites. *Broader impacts:* Diverse group of PIs and professional staff bring a new level of management innovation and capacity building to NEES network-wide operations. NEEShub provides broader access to a wealth of experimental data from rock at NEES Laboratories and from international partners, extensive simulation resources, and a rich set of research-grade inquiry tools and streamlined data sharing capabilities. NEEShub now has 5700 registered users, thousands of data downloads from the Project Warehouse per quarter, and more than 15,000 contributors from over 182 nations. *Publications, products, tools:* NEEShub platform for cyber collaboration, Hacker and Ramirez, 2010, Ramirez, 2010, and Browning et al. 2013

4. STUDENT RECRUITMENT AND SELECTION
- Describe with as much specificity as possible how you will recruit students including a detailed description of the efforts that will be made to attract students from groups underrepresented in science and engineering (note: must be U.S. citizens, nationals, or permanent residents).



Preparing for a Successful Meeting with Your Program Officer

You are more likely to receive valuable insight into the funding potential of your idea if you follow these steps:

- Make contact early (at least several months in advance).
- Do not make a "cold call." Email a one-page concept paper along with your agency biosketch and request a phone appointment to discuss.
- Develop your concept paper using the format below. Grant writers in the Office of Research and Partnerships can help you develop this text. Email sbond@purdue.edu to request help.

Why a one-pager? Distilling your ideas into a brief summary — one that starts with a compelling storyline — will best communicate project relevance, highlight the logic of your approach, and allow targeted rather than general feedback. Many program officers will not read more than one page since multiple pages represent a proposal review rather than an idea review. While you will not be told if you are "fundable," the program officer can assess for program fit.

For NIH Use Specific Aims Page

Start with storyline:
- What is the human health problem?
- What has been done already to address this problem?
- What is the gap that still exists?
- How do you propose to address this gap?

Briefly mention why this team is ideal for the project.

Aim X: Use a bold, concrete objective for each aim. Describe each aim in one to three sentences that convey why this work needs to be done as well as what and how.

End with paragraph on expected outcomes.

For All Other Funding Agencies Use Concept Page

Start with storyline:
- What is the problem?
- What has been done already to address this problem?
- What is the gap that still exists?
- How do you propose to address this gap?

List your goals/objectives.

Describe why this team is ideal for the project.

Overview methodology.

Summarize impact of your success.

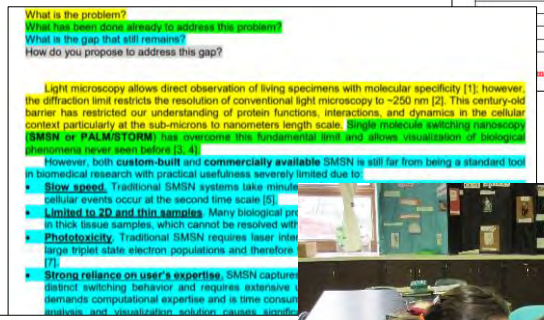
PURDUE UNIVERSITY | Office of the Executive Vice President for Research and Partnerships

What do Grant Writers Do?

General 10-week project timeline:

	1	2	3	4	5	6	7	8	9	10
Analysis and Planning										
Distribute documents noted in RFP										
Identify previously successful proposals										
Identify PI										
Notify Pre-Award Center for assigned budget specialist										
Problem Overview										
• *What is the problem*										
• *What has already been done to address problem*										
• *What gaps remain*										
• *How we propose to address gaps*										
Vision										
Goals										
Identify proposal win themes/discriminators										
Program Officer Input										
Contact PO	initial									
Team debrief on meeting										
Refine initial analysis/planning										
Proposed Outline										
Discuss/refine outline structure										
More detailed outline, if needed										
Identify graphics needed										
Partnerships										
Recruit collaborative partners										
Produce "talking points" brochure or website										
Recruit industry affiliates										
Recruit advisory board members										
Collect letters of commitment										
Management and Personnel										
Identify basic management structure										
Collect biosketches										
Proposal Writing and Editing										
Assign writing										
Write section components										
Compile 1st draft										
Project team 1st edit										
Any outside review input/edit										
Editing iterations										
Write summary or abstract										

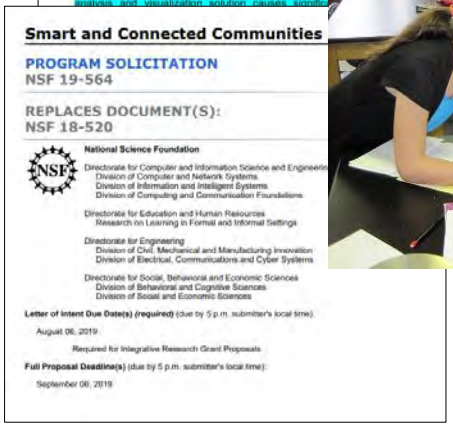
mportant to have agreement (and explicit text for problem overview) prior to proposal writing


What is the problem?
What has been done already to address this problem?
What is the gap that still remains?
How do you propose to address this gap?

Light microscopy allows direct observation of living specimens with molecular specificity [1]; however, the diffraction limit restricts the resolution of conventional light microscopy to ~250 nm [2]. This century-old barrier has restricted our understanding of protein functions, interactions, and dynamics in the cellular context particularly at the sub-microns to nanometers length scale. Single molecule switching nanoscopy (**SMSN or PALM/STORM**) has overcome this fundamental limit and allows visualization of biological phenomena never seen before [3, 4].

However, both **custom-built** and **commercially available** SMSN is still far from being a standard tool in biomedical research with practical usefulness severely limited due to:

- **Slow speed.** Traditional SMSN systems take minute
cellular events occur at the second time scale [5].
- **Limited to 2D and thin samples.** Many biological pr
in thick tissue samples, which cannot be resolved with
- **Phototoxicity.** Traditional SMSN requires laser inte
large triplet state electron populations and therefore
[7].
- **Strong reliance on user's expertise.** SMSN capture
distinct switching behavior and requires extensive
demands computational expertise and is time consu
analysis and visualization solution causes signific


Smart and Connected Communities

PROGRAM SOLICITATION
NSF 19-564

REPLACES DOCUMENT(S):
NSF 18-520

National Science Foundation

Directorate for Computer and Information Science and Engineering
Division of Computer and Network Systems
Division of Information and Intelligent Systems
Division of Computing and Communication Foundations

Directorate for Education and Human Resources
Research on Learning in Formal and Informal Settings

Directorate for Engineering
Division of Civil, Mechanical and Manufacturing Innovation
Division of Electrical, Communications and Cyber Systems

Directorate for Social, Behavioral and Economic Sciences
Division of Behavioral and Cognitive Sciences
Division of Social and Economic Sciences

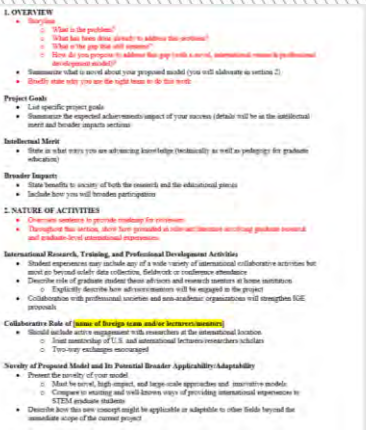
Letter of Intent Due Date(s) *(required)* (due by 5 p.m. submitter's local time):

August 06, 2019

Required for Integrative Research Grant Proposals

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

September 06, 2019


1. OVERVIEW

- Storyline
  - What is the problem?
  - What has been done already to address this problem?
  - What is the gap that still remains?
  - How do you propose to address this gap (with a novel, international research/professional development model)?
- Summarize what is novel about your proposed model (you will elaborate in section 2).
- Briefly state why you are the right team to do this work.

Project Goals

- List specific project goals.
- Summarize the expected achievements/impact of your success (details will be in the intellectual merit and broader impacts sections).

Intellectual Merit

- State in what ways you are advancing knowledge (technically as well as pedagogy for graduate education)

Broader Impacts

- State benefits to society of both the research and the educational pieces
- Include how you will broaden participation

2. NATURE OF ACTIVITIES

- Overview sentence to provide roadmap for reviewers:
- Throughout this section, show how grounded in relevant literature involving graduate research and graduate-level international experiences.

International Research, Training, and Professional Development Activities

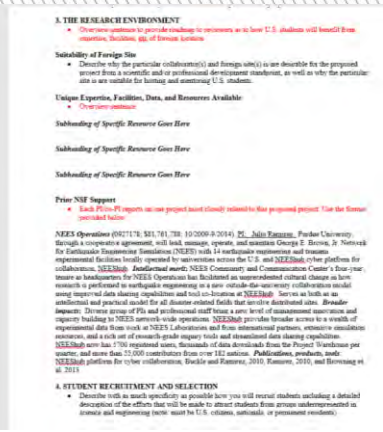
- Student experiences may include any of a wide variety of international collaborative activities but must go beyond solely data collection, fieldwork or conference attendance
- Describe role of graduate student these advisors and research mentors at home institution
  - Explicitly describe how advisors/mentors will be engaged in the project
- Collaboration with professional societies and non-academic organizations will strengthen IGE proposals

Collaborative Role of [name of foreign team and/or lecturers/mentors]

- Should include active engagement with researchers at the international location
  - Joint mentorship of U.S. and international lecturers/researchers scholars
  - Two-way exchanges encouraged

Novelty of Proposed Model and Its Potential Broader Applicability/Adaptability

- Present the novelty of your model
  - Must be novel, high-impact, and large-scale approaches and innovative models.
  - Compare to existing and well-known ways of providing international experiences to STEM graduate students
- Describe how this new concept might be applicable or adaptable to other fields beyond the immediate scope of the current project


3. THE RESEARCH ENVIRONMENT

- Overview sentence to provide roadmap for reviewers as to how U.S. students will benefit from expertise, facilities, etc. of foreign partners

Suitability of Foreign Site

- Describe why the particular collaborator(s) and foreign site(s) is are desirable for the proposed project from a scientific and/or professional development standpoint, as well as why the particular site is are suitable for hosting and mentoring U.S. students.

Unique Expertise, Facilities, Data, and Resources Available

- Overview sentence

Subheading of Specific Resource Goes Here

Subheading of Specific Resource Goes Here

Subheading of Specific Resource Goes Here

Prior NSF Support

- Each PI/co-PI reports on one project most closely related to this proposed project. Use the format provided below:

NEES Operations (0927178; $81,761,788; 10/2009-9/2014). PI: Julio Ramirez, Purdue University, through a cooperative agreement, will lead, manage, operate, and maintain George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) with 14 earthquake engineering and tsunami experimental facilities locally operated by universities across the U.S. and NEEShub cyber platform for collaboration, NEEShub. ***Intellectual merit:*** NEES Community and Communication Center's four-year tenure as headquarters for NEES Operations has facilitated an unprecedented cultural change as how research is performed in earthquake engineering as a new outside-the-university collaboration model using improved data sharing capabilities and tool co-location at NEEShub. Serves as both as an intellectual and practical model for all disaster-related fields that involve distributed sites. ***Broader impacts:*** Diverse group of PIs and professional staff bring a new level of management innovation and capacity building to NEES network-wide operations. NEEShub provides broader access to a wealth of experimental data from work at NEES Laboratories and from international partners, extensive simulation resources, and a rich set of research-grade inquiry tools and streamlined data sharing capabilities. NEEShub now has 5700 registered users, thousands of data downloads from the Project Warehouse per quarter, and more than 15,000 contributors from over 182 nations. ***Publications, products, tools:*** NEEShub platform for cyber collaboration, Hacker and Ramirez, 2010, Ramirez, 2010, and Browning et al. 2013

4. STUDENT RECRUITMENT AND SELECTION

- Describe with as much specificity as possible how you will recruit students including a detailed description of the efforts that will be made to attract students from groups underrepresented in science and engineering (note: must be U.S. citizens, nationals, or permanent residents)

Preparing for a Successful Meeting with Your Program Officer

You are more likely to receive valuable insight into the funding potential of your idea if you follow these steps:

- Make contact early (at least several months in advance).
- Do not make a "cold call." Email a one-page concept paper along with your agency biosketch and request a phone appointment to discuss.
- Develop your concept paper using the format below. Grant writers in the Office of Research and Partnerships can help you develop this text. Email sbond@purdue.edu to request help.

Why a one-pager? Distilling your ideas into a brief summary — one that starts with a compelling storyline — will best communicate project relevance, highlight the logic of your approach, and allow targeted rather than general feedback. Many program officers will not read more than one page since multiple pages represent a proposal review rather than an idea review. While you will not be told if you are "fundable," the program officer can assess for program fit.

For NIH Use Specific Aims Page

Start with storyline:
- What is the human health problem?
- What has been done already to address this problem?
- What is the gap that still exists?
- How do you propose to address this gap?

Briefly mention why this team is ideal for the project.

Aim X: Use a bold, concrete objective for each aim. Describe each aim in one to three sentences that convey why this work needs to be done as well as what and how.

End with paragraph on expected outcomes.

For All Other Funding Agencies Use Concept Page

Start with storyline:
- What is the problem?
- What has been done already to address this problem?
- What is the gap that still exists?
- How do you propose to address this gap?

List your goals/objectives.

Describe why this team is ideal for the project.

Overview methodology.

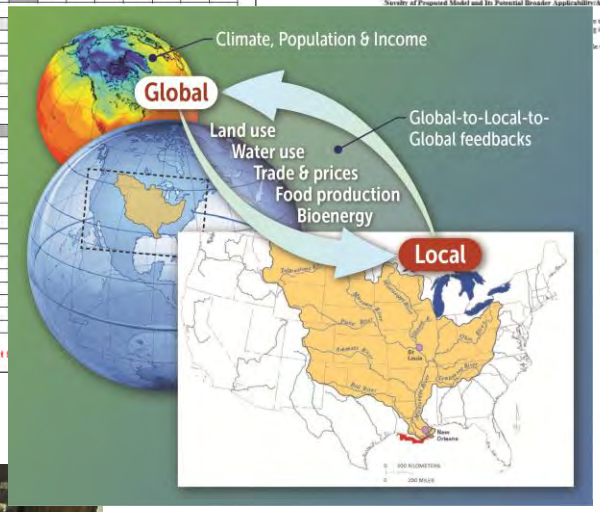
Summarize impact of your success.

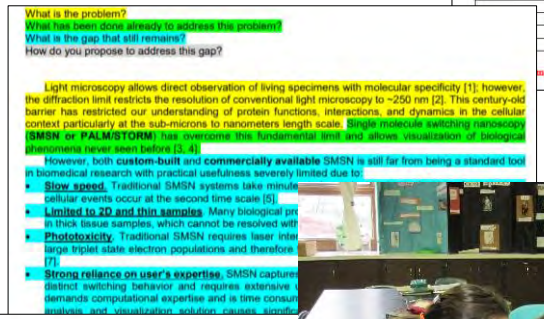
PURDUE UNIVERSITY | Office of the Executive Vice President for Research and Partnerships

What do Grant Writers Do?

General 10-week project timeline:

	1	2	3	4	5	6	7	8	9	10
Analysis and Planning										
Distribute documents noted in RFP										
Identify previously successful proposals										
Identify PI										
Notify Pre-Award Center for assigned budget specialist										
Problem Overview										
• *What is the problem*										
• *What has already been done to address problem*										
• *What gaps remain*										
• *How we propose to address gaps*										
Vision										
Goals										
Identify proposal win themes/discriminators										
Program Officer Input										
Contact PO	initial									
Team debrief on meeting										
Refine initial analysis/planning										
Proposed Outline										
Discuss/refine outline structure										
More detailed outline, if needed										
Identify graphics needed										
Partnerships										
Recruit collaborative partners										
Produce "talking points" brochure or website										
Recruit industry affiliates										
Recruit advisory board members										
Collect letters of commitment										
Management and Personnel										
Identify basic management structure										
Collect biosketches										
Proposal Writing and Editing										
Assign writing										
Write section components										
Compile 1st draft										
Project team 1st edit										
Any outside review input/edit										
Editing iterations										
Write summary or abstract										

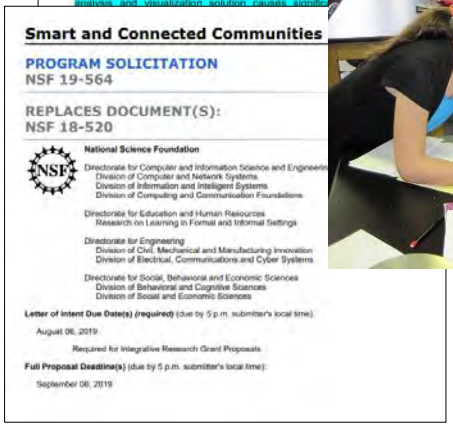



What is the problem?
What has been done already to address this problem?
What is the gap that still remains?
How do you propose to address this gap?

Light microscopy allows direct observation of living specimens with molecular specificity [1]; however, the diffraction limit restricts the resolution of conventional light microscopy to ~250 nm [2]. This century-old barrier has restricted our understanding of protein functions, interactions, and dynamics in the cellular context particularly at the sub-microns to nanometers length scale. Single molecule switching nanoscopy (**SMSN or PALM/STORM**) has overcome this fundamental limit and allows visualization of biological phenomena never seen before [3, 4].

However, both **custom-built** and **commercially available** SMSN is still far from being a standard tool in biomedical research with practical usefulness severely limited due to:

- **Slow speed.** Traditional SMSN systems take minute… cellular events occur at the second time scale [5].
- **Limited to 2D and thin samples.** Many biological pr… in thick tissue samples, which cannot be resolved with…
- **Phototoxicity.** Traditional SMSN requires laser inte… large triplet state electron populations and therefore … [7].
- **Strong reliance on user's expertise.** SMSN capture… distinct switching behavior and requires extensive … demands computational expertise and is time consum… analysis and visualization solution causes signific…


Smart and Connected Communities

PROGRAM SOLICITATION
NSF 19-564

REPLACES DOCUMENT(S):
NSF 18-520

National Science Foundation

Directorate for Computer and Information Science and Engineering
Division of Computer and Network Systems
Division of Information and Intelligent Systems
Division of Computing and Communication Foundations

Directorate for Education and Human Resources
Research on Learning in Formal and Informal Settings

Directorate for Engineering
Division of Civil, Mechanical and Manufacturing Innovation
Division of Electrical, Communications and Cyber Systems

Directorate for Social, Behavioral and Economic Sciences
Division of Behavioral and Cognitive Sciences
Division of Social and Economic Sciences

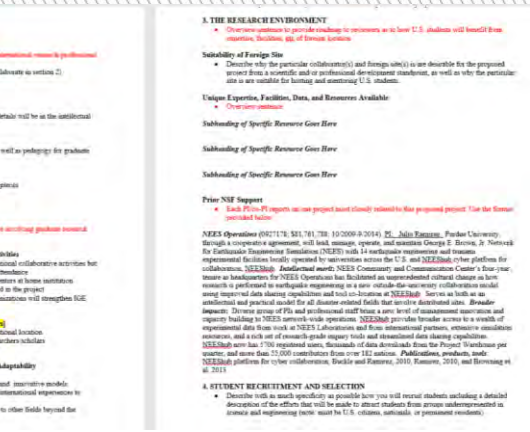
Letter of Intent Due Date(s) *(required)* (due by 5 p.m. submitter's local time):

August 06, 2019

Required for Integrative Research Grant Proposals

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

September 06, 2019


1. OVERVIEW
- Storyline
  - What is the problem?
  - What has been done already to address this problem?
  - What is the gap that still remains?
  - How do you propose to address this gap (with a novel, international research/professional development model)?
- Summarize what is novel about your proposed model (you will elaborate in section 2).
- Briefly state why you are the right team to do this work.

Project Goals
- List specific project goals
- Summarize the expected achievements/impact of your success (details will be in the intellectual merit and broader impacts sections)

Intellectual Merit
- State in what ways you are advancing knowledge (technically as well as pedagogy for graduate education)

Broader Impacts
- State benefits to society of both the research and the educational pieces
- Include how you will broaden participation

2. NATURE OF ACTIVITIES
- Overview sentence to provide roadmap for reviewers:
- Throughout this section, show how grounded in relevant literature involving graduate research and graduate-level international experiences.

International Research, Training, and Professional Development Activities
- Student experiences may include any of a wide variety of international collaborative activities but must go beyond solely data collection, fieldwork or conference attendance
- Describe role of graduate student these advisors and research mentors at home institution
  - Explicitly describe how advisors/mentors will be engaged in the project
- Collaboration with professional societies and non-academic organizations will strengthen IGE proposals

Collaborative Role of [name of foreign team and/or lecturers/mentors]
- Should include active engagement with researchers at the international location
  - Joint mentorship of U.S. and international lecturers/researchers/scholars
  - Two-way exchanges encouraged

Novelty of Proposed Model and Its Potential Broader Applicability/Adaptability

3. THE RESEARCH ENVIRONMENT
- Overview sentence to provide roadmap for reviewers as to how U.S. students will benefit from expertise, facilities, etc. of foreign partners

Suitability of Foreign Site
- Describe why the particular collaborator(s) and foreign site(s) is are desirable for the proposed project from a scientific and/or professional development standpoint, as well as why the particular site is are suitable for hosting and mentoring U.S. students.

Unique Expertise, Facilities, Data, and Resources Available
- Overview sentence

Subheading of Specific Resource Goes Here

Subheading of Specific Resource Goes Here

Subheading of Specific Resource Goes Here

Prior NSF Support
- Each PI/co-PI reports on one project most closely related to this proposed project. Use the format provided below:

NEES Operations (0927178; $81,761,788; 10/2009-9/2014). PI: Julio Ramirez, Purdue University, through a cooperative agreement, will lead, manage, operate, and maintain George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) with 14 earthquake engineering and tsunami experimental facilities locally operated by universities across the U.S. and NEEShub cyber platform for collaboration, NEEShub. *Intellectual merit:* NEES Community and Communication Center's four-year… tenure as headquarters for NEES Operations has facilitated an unprecedented cultural change as how research is performed in earthquake engineering as a new outside-the-university collaboration model using improved data sharing capabilities and tool co-location at NEEShub. Serves as both as an intellectual and practical model for all disaster-related fields that involve distributed sites. *Broader impacts:* Diverse group of PIs and professional staff bring a new level of management innovation and capacity building to NEES network-wide operations. NEEShub provides broader access to a wealth of experimental data from rock at NEES Laboratories and from international partners, extensive simulation resources, and a rich set of research-grade inquiry tools and streamlined data sharing capabilities. NEEShub now has 5700 registered users, thousands of data downloads from the Project Warehouse per quarter, and more than 15,000 contributors from over 182 nations. *Publications, products, tools:* NEEShub platform for cyber collaboration, Hacker and Ramirez, 2010, Ramirez, 2010, and Browning et al. 2013

4. STUDENT RECRUITMENT AND SELECTION
- Describe with as much specificity as possible how you will recruit students including a detailed description of the efforts that will be made to attract students from groups underrepresented in science and engineering (note: must be U.S. citizens, nationals, or permanent residents)

Preparing for a Successful Meeting with Your Program Officer

You are more likely to receive valuable insight into the funding potential of your idea if you follow these steps:

- Make contact early (at least several months in advance).
- Do not make a "cold call." Email a one-page concept paper along with your agency biosketch and request a phone appointment to discuss.
- Develop your concept paper using the format below. Grant writers in the Office of Research and Partnerships can help you develop this text. Email sbond@purdue.edu to request help.

Why a one-pager? Distilling your ideas into a brief summary — one that starts with a compelling storyline — will best communicate project relevance, highlight the logic of your approach, and allow targeted rather than general feedback. Many program officers will not read more than one page since multiple pages represent a proposal review rather than an idea review. While you will not be told if you are "fundable," the program officer can assess for program fit.

For NIH Use Specific Aims Page

Start with storyline:
- What is the human health problem?
- What has been done already to address this problem?
- What is the gap that still exists?
- How do you propose to address this gap?

Briefly mention why this team is ideal for the project.

Aim X: Use a bold, concrete objective for each aim. Describe each aim in one to three sentences that convey why this work needs to be done as well as what and how.

End with paragraph on expected outcomes.

For All Other Funding Agencies Use Concept Page

Start with storyline:
- What is the problem?
- What has been done already to address this problem?
- What is the gap that still exists?
- How do you propose to address this gap?

List your goals/objectives.

Describe why this team is ideal for the project.

Overview methodology.

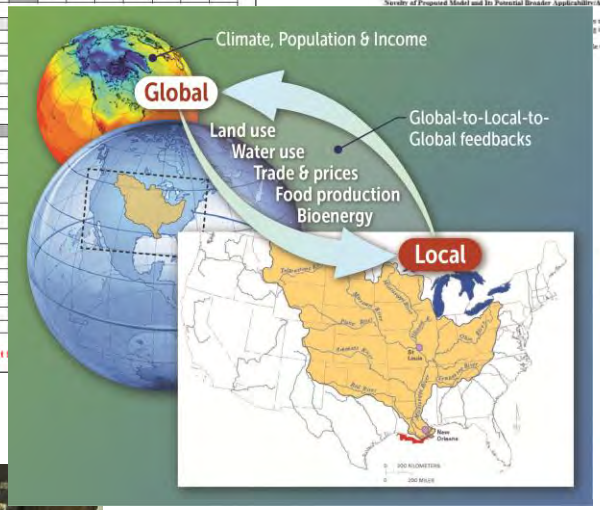
Summarize impact of your success.

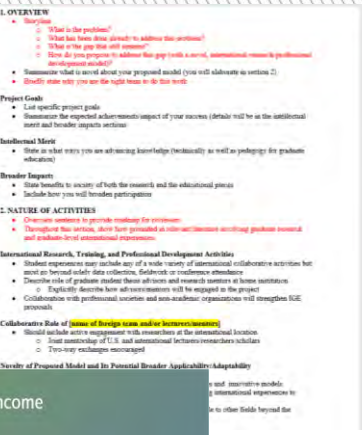
PURDUE UNIVERSITY | Office of the Executive Vice President for Research and Partnerships

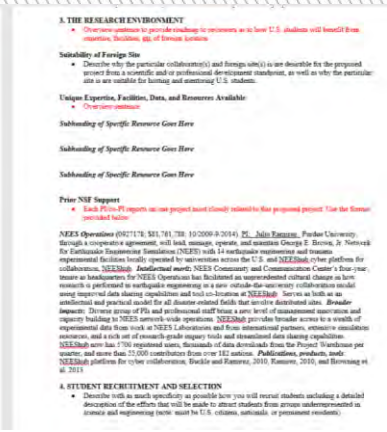
What do Grant Writers Do?

General 10-week project timeline:

	1	2	3	4	5	6	7	8	9	10
Analysis and Planning										
Distribute documents noted in RFP										
Identify previously successful proposals										
Identify PI										
Notify Pre-Award Center for assigned budget specialist										
Problem Overview										
• *What is the problem*										
• *What has already been done to address problem*										
• *What gaps remain*										
• *How we propose to address gaps*										
Vision										
Goals										
Identify proposal win themes/discriminators										
Program Officer Input										
Contact PO	initial									
Team debrief on meeting										
Refine initial analysis/planning										
Proposed Outline										
Discuss/refine outline structure										
More detailed outline, if needed										
Identify graphics needed										
Partnerships										
Recruit collaborative partners										
Produce "talking points" brochure or website										
Recruit industry affiliates										
Recruit advisory board members										
Collect letters of commitment										
Management and Personnel										
Identify basic management structure										
Collect biosketches										
Proposal Writing and Editing										
Assign writing										
Write section components										
Compile 1st draft										
Project team 1st edit										
Any outside review input/edit										
Editing iterations										
Write summary or abstract										







What is the problem?
What has been done already to address this problem?
What is the gap that still remains?
How do you propose to address this gap?

Light microscopy allows direct observation of living specimens with molecular specificity [1]; however, the diffraction limit restricts the resolution of conventional light microscopy to ~250 nm [2]. This century-old barrier has restricted our understanding of protein functions, interactions, and dynamics in the cellular context particularly at the sub-microns to nanometers length scale. Single molecule switching nanoscopy (**SMSN or PALM/STORM**) has overcome this fundamental limit and allows visualization of biological phenomena never seen before [3, 4].

However, both **custom-built** and **commercially available** SMSN is still far from being a standard tool in biomedical research with practical usefulness severely limited due to:

- **Slow speed.** Traditional SMSN systems take minute… cellular events occur at the second time scale [5].
- **Limited to 2D and thin samples.** Many biological pr… in thick tissue samples, which cannot be resolved with…
- **Phototoxicity.** Traditional SMSN requires laser inte… large triplet state electron populations and therefore … [7].
- **Strong reliance on user's expertise.** SMSN capture… distinct switching behavior and requires extensive … demands computational expertise and is time consum… analysis and visualization solution causes signific…

Preparing for a Successful Meeting with Your Program Officer

You are more likely to receive valuable insight into the funding potential of your idea if you follow these steps:

- Make contact early (at least several months in advance).
- Do not make a "cold call." Email a one-page concept paper along with your agency biosketch and request a phone appointment to discuss.
- Develop your concept paper using the format below. Grant writers in the Office of Research and Partnerships can help you develop this text. Email sbond@purdue.edu to request help.

Why a one-pager? Distilling your ideas into a brief summary — one that starts with a compelling storyline — will best communicate project relevance, highlight the logic of your approach, and allow targeted rather than general feedback. Many program officers will not read more than one page since multiple pages represent a proposal review rather than an idea review. While you will not be told if you are "fundable," the program officer can assess for program fit.

For NIH Use Specific Aims Page

Start with storyline:

- What is the human health problem?
- …en done already to address …?
- …gap that still exists?
- …propose to address this gap?

…ion why this team is …project.

…bold, concrete …each aim. Describe each …ee sentences that convey …eds to be done as well as …

…agraph on expected …

For All Other Funding Agencies Use Concept Page

Start with storyline:

- What is the problem?
- What has been done already to address this problem?
- What is the gap that still exists?
- How do you propose to address this gap?

List your goals/objectives.

Describe why this team is ideal for the project.

Overview methodology.

Summarize impact of your success.

…URDUE UNIVERSITY | Office of the Executive Vice President for Research and Partnerships

Smart and Connected Communities

PROGRAM SOLICITATION
NSF 19-564

REPLACES DOCUMENT(S):
NSF 18-520

National Science Foundation

Directorate for Computer and Information Science and Engineering
Division of Computer and Network Systems
Division of Information and Intelligent Systems
Division of Computing and Communication Foundations

Directorate for Education and Human Resources
Research on Learning in Formal and Informal Settings

Directorate for Engineering
Division of Civil, Mechanical and Manufacturing Innovation
Division of Electrical, Communications and Cyber Systems

Directorate for Social, Behavioral and Economic Sciences
Division of Behavioral and Cognitive Sciences
Division of Social and Economic Sciences

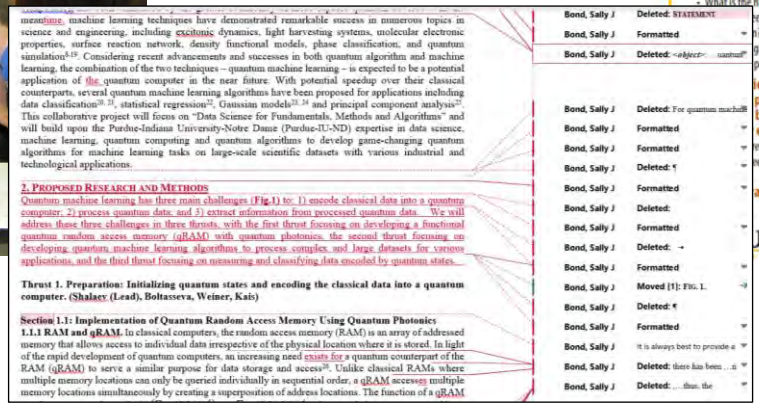
Letter of Intent Due Date(s) *(required)* (due by 5 p.m. submitter's local time):

August 06, 2019

Required for Integrative Research Grant Proposals

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

September 06, 2019



meantime, machine learning techniques have demonstrated remarkable success in numerous topics in science and engineering, including exotonic dynamics, light harvesting systems, molecular electronic properties, surface reaction network, density functional models, phase classification, and quantum simulation[8,9]. Considering recent advancements and successes in both quantum algorithm and machine learning, the combination of the two techniques – quantum machine learning – is expected to be a potential application of the quantum computer in the near future. With potential speedup over their classical counterparts, several quantum machine learning algorithms have been proposed for applications including data classification[10, 21], statistical regression[22], Gaussian models[23, 24] and principal component analysis[25]. This collaborative project will focus on "Data Science for Fundamentals, Methods and Algorithms" and will build upon the Purdue-Indiana University-Notre Dame (Purdue-IU-ND) expertise in data science, machine learning, quantum computing and quantum algorithms to develop game-changing quantum algorithms for machine learning tasks on large-scale scientific datasets with various industrial and technological applications.

2. PROPOSED RESEARCH AND METHODS

Quantum machine learning has three main challenges (**Fig.1**) to: 1) encode classical data into a quantum computer; 2) process quantum data; and 3) extract information from processed quantum data. We will address these three challenges in three thrusts, with the first thrust focusing on developing a functional quantum random access memory (qRAM) with quantum photonics, the second thrust focusing on developing quantum machine learning algorithms to process complex and large datasets for various applications, and the third thrust focusing on measuring and classifying data encoded by quantum states.

Thrust 1. Preparation: Initializing quantum states and encoding the classical data into a quantum computer. (Shalaev (Lead), Boltasseva, Weiner, Kais)

Section 1.1: Implementation of Quantum Random Access Memory Using Quantum Photonics

1.1.1 RAM and qRAM. In classical computers, the random access memory (RAM) is an array of addressed memory that allows access to individual data irrespective of the physical location where it is stored. In light of the rapid development of quantum computers, an increasing need exists for a quantum counterpart of the RAM (qRAM) to serve a similar purpose for data storage and access[26]. Unlike classical RAMs where multiple memory locations can only be queried individually in sequential order, a qRAM accesses multiple memory locations simultaneously by creating a superposition of address locations. The function of a qRAM

Bond, Sally J: Deleted: STATEMENT
Bond, Sally J: Formatted
Bond, Sally J: Deleted: <object> …ustrud"
Bond, Sally J: Deleted: For quantum machine
Bond, Sally J: Formatted
Bond, Sally J: Formatted
Bond, Sally J: Deleted: ¶
Bond, Sally J: Formatted
Bond, Sally J: Deleted:
Bond, Sally J: Formatted
Bond, Sally J: Deleted: →
Bond, Sally J: Formatted
Bond, Sally J: Moved [1]: FIG. 1.
Bond, Sally J: Deleted: ¶
Bond, Sally J: Formatted
Bond, Sally J: It is always best to provide a
Bond, Sally J: Deleted: there has been …n
Bond, Sally J: Deleted: …thus, the

Workshops and Training

Grantsmanship Events

A series of grantsmanship workshops are hosted throughout the year by the Office of Research. Many of these workshops are particularly useful for new faculty or those new to the research process at Purdue.

For further information and to register for an upcoming workshop, click on the link below. Please note that registration becomes available approximately one month prior to the event, at which point the workshop title becomes a hyperlink.

When possible, an archive of each presentation is available from the ***Past Events*** list below.

Upcoming Event List

Finding Funding, Limited Submissions, and Proposal Submission	Thursday, September 4, 2025 1:30 – 3:00 p.m. STEW 202	Overview of how to locate funding opportunities from federal, foundation and industrial sponsors. Summary of the limited submission process. Working with Pre-award for proposal submissions. To register, click HERE.
Successful Grant Writing Strategies	Tuesday, September 30, 2025 1:30 - 3:00 p.m. STEW 214	Learn best practices for proposal writing and what services are available to assist you in these efforts. To register, click HERE.
NIH 101	Wednesday, October 1, 2025 1:30 – 3:00 p.m. STEW 202	This session provides an overview of the NIH and teaches tips for finding the best NIH Institute/Center for your research interests as well as strategies for successful proposals. To register, click HERE.
NIH 102	Wednesday, October 8, 2025 1:00 – 2:30 p.m. STEW 311	This session provides additional guidance on tools and resources available to help you succeed with NIH proposals. This session is a follow-up to NIH 101 but participation in 101 is not necessary for attendance at this session. To register, click HERE.
Write Winning Grants Phase I Seminar	Wednesday, October 29, 2025 8:30 a.m. – 6:00 p.m. STEW 302	We are pleased to once again welcome Dr. John Robertson of Grant Writers' Seminars & Workshop to Purdue. This full-day session is packed with helpful tips for writing successful grants. While the workshop will have a heavy emphasis on NIH and NSF, the information is applicable to proposal writing to *any* sponsor. Registration will open in late August.
Understanding Proposal Budgets	Tuesday, November 4, 2025 1:30 – 3:00 p.m. STEW 310	This session provides an overview of how Sponsored Program Services (SPS) Pre-award office can assist you in developing a comprehensive budget for your proposal. Also, what is cost share and when/how do you include it in a proposal? To register, click HERE.
Managing Your Award: SPS Post-Award and Contracting	Wednesday, November 19, 2025 1:30 – 3:00 p.m. STEW 202	You've received an award. Now what? Learn how SPS Post-award can help establish your award. Also, learn what internal steps you need to take if a sponsor requires a contract. To register, click HERE.
Research Regulatory Affairs	Monday, November 24, 2025 1:30 – 3:00 p.m. STEW 202	Learn about the important rules and regulations you need to follow related to your research including IRB, IACUC, Export Controls, and Biosafety. To register, click HERE.
How to Write a Competitive NSF CAREER Proposal	Thursday, January 29, 2026 1:30 - 3:30 p.m. STEW 218	CAREER is NSF's most prestigious award to recognize the outstanding research of young investigators. Learn about special nuances of this program and how to prepare a strong proposal targeted to the goals of this program. To register, click HERE.
Large Center Proposals	Tuesday, February 10, 2026 1:30 - 3:00 p.m. STEW 313	This session will focus on developing competitive large-scale center proposal submissions. We will highlight the importance of early planning, aligning with the right funding opportunity, and strategically identifying partners to strengthen the proposal vision and impact. Learn how to position your team for success through insights into the proposal development process and common pitfalls to avoid.

Workshops and Training

Grantsmanship Events

A series of grantsmanship workshops are hosted throughout the year by the Office of Research. Many of these workshops are particularly useful for new faculty or those new to the research process at Purdue.

For further information and to register for an upcoming workshop, click on the link below. Please note that registration becomes available approximately one month prior to the event, at which point the workshop title becomes a hyperlink.

When possible, an archive of each presentation is available from the ***Past Events*** list below.

Upcoming Event List

Finding Funding, Limited Submissions, and Proposal Submissions	Thursday, September 4, 2025 1:30 – 3:00 p.m. STEW 202	Overview of how to locate funding opportunities from federal, foundation and industrial sponsors. Summary of the limited submission process. Working with Pre-award for proposal submissions. To register, click HERE.
Successful Grant Writing Strategies	Tuesday, September 30, 2025 1:30 - 3:00 p.m. STEW 214	Learn best practices for proposal writing and what services are available to assist you in these efforts. To register, click HERE.
NIH 101	Wednesday, October 1, 2025 1:30 – 3:00 p.m. STEW 202	This session provides an overview of the NIH and teaches tips for finding the best NIH Institute/Center for your research interests as well as strategies for successful proposals. To register, click HERE.
NIH 102	Wednesday, October 8, 2025 1:00 – 2:30 p.m. STEW 311	This session provides additional guidance on tools and resources available to help you succeed with NIH proposals. This session is a follow-up to NIH 101 but participation in 101 is not necessary for attendance at this session. To register, click HERE.
Write Winning Grants Phase I Seminar	Wednesday, October 29, 2025 8:30 a.m. – 6:00 p.m. STEW 302	We are pleased to once again welcome Dr. John Robertson of Grant Writers' Seminars & Workshop to Purdue. This full-day session is packed with helpful tips for writing successful grants. While the workshop will have a heavy emphasis on NIH and NSF, the information is applicable to proposal writing to *any* sponsor. Registration will open in late August.
Understanding Proposal Budgets	Tuesday, November 4, 2025 1:30 – 3:00 p.m. STEW 310	This session provides an overview of how Sponsored Program Services (SPS) Pre-award office can assist you in developing a comprehensive budget for your proposal. Also, what is cost share and when/how do you include it in a proposal? To register, click HERE.
Managing Your Award: SPS Post-Award and Contracting	Wednesday, November 19, 2025 1:30 – 3:00 p.m. STEW 202	You've received an award. Now what? Learn how SPS Post-award can help establish your award. Also, learn what internal steps you need to take if a sponsor requires a contract. To register, click HERE.
Research Regulatory Affairs	Monday, November 24, 2025 1:30 – 3:00 p.m. STEW 202	Learn about the important rules and regulations you need to follow related to your research including IRB, IACUC, Export Controls, and Biosafety. To register, click HERE.
How to Write a Competitive NSF CAREER Proposal	Thursday, January 29, 2026 1:30 - 3:30 p.m. STEW 218	CAREER is NSF's most prestigious award to recognize the outstanding research of young investigators. Learn about special nuances of this program and how to prepare a strong proposal targeted to the goals of this program. To register, click HERE.
Large Center Proposals	Tuesday, February 10, 2026 1:30 - 3:00 p.m. STEW 313	This session will focus on developing competitive large-scale center proposal submissions. We will highlight the importance of early planning, aligning with the right funding opportunity, and strategically identifying partners to strengthen the proposal vision and impact. Learn how to position your team for success through insights into the proposal development process and common pitfalls to avoid.